VOL. 6 NO. 11
June 15, 1981

Energy Research Abstracts

ABSTRACTS 15180-16343

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications which are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the energy data base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below.

PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $3.00, foreign $3.75 per copy; annual cumulative index, domestic $4.00, foreign $5.00 per copy. The annual subscription price is $38.00 for domestic subscribers and $47.50 for foreign subscribers.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. Indexes are cumulated semiannually and annually. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues including a semiannual index and an annual index is $184.00 for domestic subscribers and $230.00 for foreign subscribers. The semiannual and annual indexes will also be available separately to subscribers. The cost for the semiannual index is $18.00 (domestic) or $22.50 (foreign); the annual index is $33.00 (domestic) or $41.25 (foreign). A single issue costs $5.55 (domestic) or $6.95 (foreign).

The following publications are available to the public on a subscription basis from the National Technical Information Service (NTIS), Springfield, Virginia 22161. The annual subscription rate for one volume (calendar) year (12 issues plus cumulative index) is $45.00 for domestic subscribers and $90.00 for subscribers outside the North American Continent. A single issue is $6.00 (domestic) and $12.00 (outside the North American Continent).

Current Energy Patents (CEP)

A monthly publication providing abstracting and indexing coverage of the international patent literature, including patent applications, that concerns any aspect of energy production, conservation, and utilization. Available as PB81-902800.

Energy Conservation Update (ECU)

A monthly abstract journal devoted to current information on energy conservation in buildings, transportation and propulsion, and industry; waste processing plants and equipment; energy storage; energy conversion; advanced automotive systems; combustion systems; power cycles; synthetic fuels; and power transmission. Available as PB81-914800.

Energy and the Environment (EAE)

A monthly abstract journal devoted to information on the impacts of energy-related activities and radioactive and nonradioactive pollutants on the environment. Available as PB81-914900.

Fossil Energy Update (FEU)

A monthly abstract journal devoted to information on the processing and use of fossil fuels. Available as PB81-914600.

Fusion Energy Update (CFU)

A monthly abstract journal devoted to information on controlled thermonuclear research. Available as PB81-915300.

Geothermal Energy Update (GEU)

A monthly abstract journal devoted to information on the exploration and development of geothermal resources. Available as PB81-914700.

Solar Energy Update (SEU)

A monthly abstract journal devoted to information on the utilization of solar, tidal, and wind energy. Available as PB81-914500.

Synthetic Fuels Update (SFU)

A monthly abstract journal devoted to information on coal gasification; coal liquefaction; other coal processing; biomass conversion to fuel; shale oil and tar sand bitumen production; hydrogen fuels; other hydrocarbon fuels; alcohol fuels; and inorganic hydrogen compound fuels. Available as PB81-902700.

INTERNATIONAL ENERGY PUBLICATIONS

Atomindex (Published in cooperation with the Technical Information Center by the International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria)

A semimonthly abstract journal devoted to information on nuclear science and technology. Through an exchange agreement, IAEA/INIS provides all non-U. S. nuclear information of *Atomindex* to TIC for inclusion in the DOE/RECON Data Base; in turn, TIC provides all U. S. nuclear information to IAEA/INIS for inclusion in *Atomindex*. *Atomindex* is available by subscription from UNIPUB, P.O. Box 433, Murray Hill Station, New York, NY 10016. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $150.

Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)

A monthly abstract journal devoted to information on coal. Through an exchange agreement, IEA Coal Research provides all non-U. S. coal information of *Coal Abstracts* to TIC for inclusion in the DOE/RECON Data Base; in turn, TIC provides all U. S. coal information to IEA Coal Research for inclusion in *Coal Abstracts*. *Coal Abstracts* is available to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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ENERGY RESEARCH ABSTRACTS

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The Technical Information Center, as the national information center for the Department of Energy, manages, publishes, and disseminates scientific, technical, and practical energy information acquired from worldwide sources. It builds and maintains energy information data bases used to prepare abstracting journals, bibliographies, and literature searches. The data bases are also searchable via the Department's on-line retrieval system, DOE/RECON. This information is provided to DOE program offices and contractors; scientists; engineers; educational, commercial, and industrial communities; and the general public. The Technical Information Center conducts an active announcement and marketing program. It establishes policy and administers control of an inventory and registry for DOE publications. The Center also develops and evaluates new and effective information systems and services as required by scientific and technical management within the Department of Energy.

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ABOUT *ENERGY RESEARCH ABSTRACTS*

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers, and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, conservation, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Federal, state, and municipal agencies concerned with energy development, conservation, and usage may obtain *ERA* free of charge. Inquiries should be directed to the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

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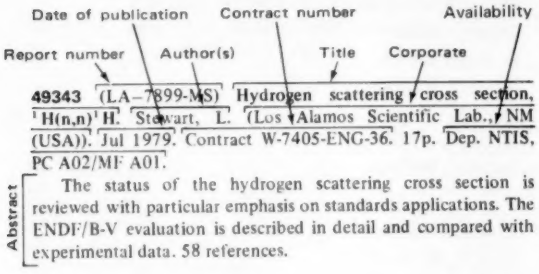
The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Date of publication
Contract number
Availability
Report number
Author(s)
Title
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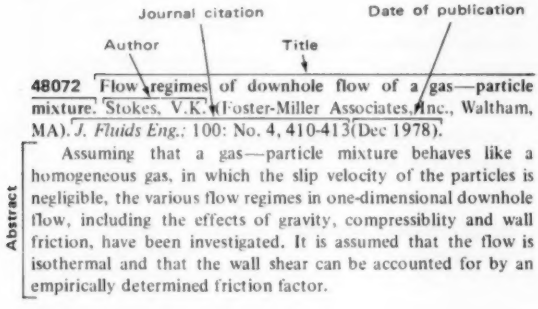
49343 (LA–7899-MS) Hydrogen scattering cross section, ¹H(n,n)¹H. Stewart, L. (Los Alamos Scientific Lab., NM (USA)). Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.
Abstract
The status of the hydrogen scattering cross section is reviewed with particular emphasis on standards applications. The ENDF/B-V evaluation is described in detail and compared with experimental data. 58 references.


Journal citation
Date of publication
Author
Title
48072 Flow regimes of downhole flow of a gas—particle mixture. Stokes, V.K. (Foster-Miller Associates, Inc., Waltham, MA). J. Fluids Eng.: 100: No. 4, 410-413 (Dec 1978).
Abstract
Assuming that a gas—particle mixture behaves like a homogeneous gas, in which the slip velocity of the particles is negligible, the various flow regimes in one-dimensional downhole flow, including the effects of gravity, compressiblity and wall friction, have been investigated. It is assumed that the flow is isothermal and that the wall shear can be accounted for by an empirically determined friction factor.

•INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. These indexes are cumulated semiannually and annually. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

•Corporate Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

49343 (LA–7899-MS) Hydrogen scattering cross section, ¹H(n,n)¹H. Stewart, L. (**Los Alamos Scientific Lab., NM (USA)**). Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Advanced laser fusion target fabrication research and development proposal. 4:48249 (LA–7619-P)
Hydrogen scattering cross section, ¹H(n,n)¹H. 4:49343 (LA–7899-MS)

•Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Stewart, L., Hydrogen scattering cross section, ¹H(n,n)¹H. 4:49343 (LA–7899-MS)
Stewart, M.D., *See* McInroy, J.F., 4:49280
Stewart, W., *See* Dean, J.W., 4:48543
Stimson, J., Reproduction, growth, and survival of Enewetak corals. 4:49200 (NVO–0703-1, pp 56-59)

•Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles and informative phrases, or both, specific to these entries are arranged alphabetically under the entries.

HYDROGEN I TARGET
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Hydrogen scattering cross section, ¹H(n,n)¹H (Above 100 keV, review), 4:49343 (LA–7899-MS)
HYDROGEN NITRATES
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Inventory of advanced energy technologies and energy conservation research and development: 1976-1978. Volume II. Prepared for the Committee on Science and Technology, U.S. House of Representatives, 96*th* Congress, 4:48749.

•Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos Scientific Lab., NM (USA)**	
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W-7405-ENG-48	**California Univ., Livermore (USA). Lawrence Livermore Lab.**	
	3:49386	UCRL–52456
	3:49431	UCRL–52405

•Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience.

LA-		
7899-MS	4:49343	Dep. NTIS, PC A02/MF A01
LA-tr-		
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SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts.* The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

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SUBJECT CONTENTS (ALPHABETICAL LISTING)

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15180 (ANL—80-118) Materials technology for coal-conversion processes. Progress report, July-September 1980. (Argonne National Lab., IL (USA)). Dec 1980. Contract W-31-109-ENG-38. 57p. NTIS, PC A04/MF A01.

Failure analysis of the refractory lining of the Grand Forks Energy Technology Center slagging gasifier revealed that sodium hydroxide had reacted with the refractory, causing a large volume change and consequent spallation. Laboratory studies on pressure coupling of acoustic waveguides to pressure boundaries for long-term erosive wear measurements show that the use of annealed copper foil [0.25-0.76 mm (10-30 mil) thick] with a contact pressure of 50-70 MPa (7-10 ksi) can yield satisfactory coupling in the presence of thermal cycling. High-temperature corrosion studies have been initiated to investigate effects of deposits such as CaO and $CaSO_4$ on corrosion rates of Fe-2-1/4Cr-1Mo and Fe-9Cr-1Mo ferritic steels. Erosion studies at room temperature and atmospheric pressure were conducted on 1015 carbon steel, 304 and 310 stainless steel, Incoloy 800, and Stellite 6B. Impact particles were 150-μm Al_2O_3 with impact angles of 16-81°. Weight-loss measurements are in good agreement with prior work. Materials studies for instrumentation included studies of thermowells at the U-Gas plant run by IGT. Analysis of a product gas line from Bi-Gas indicates that failure was caused by caustic- or oxygen-assisted stress-corrosion cracking. A product gas line expansion joint from U-gas was also examined; at present, chloride-induced pitting seems to have been the cause of this failure, which was initiated at the inner surface.

15181 (BMFT-FB-T—80-160) Final report on the reference-design of the prototype plant for hydrogasification of coal in the framework of the PNP-project. Bialuschewski, H.; Meichsner, M.; Strauss, W.; Weiner, B. (Rheinische Braunkohlenwerke A.G., Koeln (Germany, F.R.)). Dec 1980. 91p. (In German). NTIS (US Sales Only), PC A05/MF A01.

In the framework of the project Prototype Plant for Nuclear Process Heat (PNP) the Rheinische Braunkohlenwerke AG is developing the hydrogasification of coal. A semitechnical plant has been operated since 1976. A pilot plant is under construction as the next development step. The hydrogasification of coal is especially suitable for the production of SNG and can be operated conventionally as well as with nuclear process heat. This report deals with the reference-design of the prototype plant for the hydrogasification of coal. The prototype plant for the hydrogasification is part of the Prototype Plant for Nuclear Process Heat, which consists of a High-Temperature Nuclear Reactor (500 MJ/s) with one loop for testing the steam gasification and one for testing hydrogasification along with the transfer of nuclear energy.

15182 (CONF-8010162—1) Effect of four simulated coal gasifier atmospheres on the biaxial stress rupture behavior of four candidate coal gasifier alloys. Horton, R.M. (Idaho National Engineering Lab., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 34p. NTIS, PC A03/MF A01.

From American Society of Metals conference; Pittsburgh, PA, USA (28 Oct 1980).

Tests were conducted on four alloys (Type 310 stainless steel, Incoloy 800H, Haynes 188, and IN-657) which are candidates for use in coal gasifiers to determine whether their hundred-hour biaxial stress rupture strength and life were adversely affected by exposure to four simulated coal gasifier atmospheres. Exposure to these atmospheres at temperatures below 1172 K (1650°F) did not decrease these rupture properties below those measured in air. Only at 1255 K (1800°F) were the rupture properties in the various CGA atmospheres consistently below those measured in air at atmospheric pressure. Corrosion coupon tests of Inconel 600, Incoloy 800, and Type 309 stainless steel in CGA verified data obtained from similar tests by other laboratories.

15183 (DOE/ET/10104—T13) Solvent refined coal (SRC) process. Quarterly technical progress report, January 1980-March 1980. (Pittsburg and Midway Coal Mining Co., Englewood, CO (USA)). Jan 1981. Contract AC05-76ET10104. 581p. NTIS, PC A25/MF A01.

This report summarizes the progress of the Solvent Refined Coal (SRC) project at the SRC Pilot Plant in Fort Lewis, Wahsington, and the Process Development Unit (P-99) in Harmarville, Pennsylvania. After the remaining runs of the slurry preheater survey test program were completed January 14, the Fort Lewis Pilot Plant was shut down to inspect Slurry Preheater B and to insulate the coil for future testing at higher rates of heat flux. Radiographic inspection of the coil showed that the welds at the pressure taps and the immersion thermowells did not meet design specifications. Slurry Preheater A was used during the first 12 days of February while weld repairs and modifications to Slurry Preheater B were completed. Two attempts to complete a material balance run on Powhatan No. 6 Mine coal were attempted but neither was successful. Slurry Preheater B was in service the remainder of the quarter. The start of a series of runs at higher heat flux was delayed because of plugging in both the slurry and the hydrogen flow metering systems. Three baseline runs and three slurry runs of the high heat flux program were completed before the plant was shut down March 12 for repair of the Inert Gas Unit. Attempts to complete a fourth slurry run at high heat flux were unsuccessful because of problems with the coal feed handling and the vortex mix systems. Process Development Unit (P-99) completed three of the four runs designed to study the effect of dissolver L/D ratio. The fourth was under way at the end of the period. SRC yield correlations have been developed that include coal properties as independent variables. A preliminary ranking of coals according to their reactivity in PDU P-99 has been made. Techniques for studying coking phenomenona are now in place.

15184 (DOE/ET/10290—70) Molten salt coal gasification process development unit, Phase 2. Quarterly technical progress report No. 1, July-September 1980. Slater, M.H. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 20 Oct 1980. Contract AC03-77ET10296. 60p. NTIS, PC A04/MF A01.

This represents the first quarterly progress report on Phase 2 of the Molten Salt Coal Gasification Process Development Unit (PDU) Program. Phase 1 of this program started in March 1976 and included the design, construction, and initial operation of a PDU to test the Molten Salt Coal Gasification Process. On July 24, 1980, Phase 2 of the program was initiated. It covers a 1-year operations program utilizing the existing PDU and is planned to include five runs with a targeted total operating time of 9 weeks. The primary activities during the period covered by this report related to preparations for PDU Run 6, the initial run of the Phase 2 program. These activities included restaffing the PDU operations group, reactivation of the facility, and effecting plant modifications and improvements based on an evaluation of previous operation experience. The Melt Withdrawal System which had proven unreliable during the previous runs, was completely redesigned; thermal and flow analyses were performed; new components procured; and assembly initiated. Run 6 which is scheduled for the next report period, is aimed primarily at verifying the adequacy of the redesigned Melt Withdrawal System.

15185 **(DOE/ET/10463—T1(Vol.1)) Hot-gas desulfurization. I. Use of gasifier ash in a fixed-bed process. Final report.** Schrodt, J.T. (Kentucky Univ., Lexington (USA). Dept. of Chemical Engineering). 1 Apr 1980. Contract AS05-76ET10463. 262p. NTIS, PC A12/MF A01.

A method for removing gaseous sulfur compounds from coal-derived fuel gases through their reaction with the iron in gasifier coal ash has been thoroughly researched, and the results have been applied for design of a commercial scale, fixed-bed, desulfurization process. Ashes with 5-23 weight percent iron oxide have been used in small reactors to sorb hydrogen sulfide from synthesized low-Btu fuel gas. Carbonly sulfide and carbon disulfide are also removed indirectly after hydrogenation to hydrogen sulfide. Results show sulfide removal efficiencies in excess of 99 percent and ash sulfide capacities up to 5.8 weight percent. A mixture of sulfur dioxide and sulfur is recovered during regeneration of spent ashes. Cyclic use of ashes improves their overall sorption reaction rate efficiency and performance. Models have been developed, verified and used to simulate operation of commercial-scale reactors. Preliminary design of a fixed bed process suitable for desulfurization of 43 MM SCF/HR of fuel gas calls for simultaneous use of six 25 x 15 ft diameter desulfurization reactors and two regeneration reactors of equal size. The estimated plant investment is 17.5 million dollars with an annual operating cost of 4.4 million dollars that is completely offset by a 20 dollar per ton credit for by-product sulfuric acid.

15186 **(DOE/ET/10520—1) Research and development of rapid hydrogenation for coal conversion to synthetic motor fuels (riser cracking of coal). Final report, April 1, 1976-September 30, 1980.** Duncan, D.A.; Beeson, J.L.; Oberle, R.D. (Institute of Gas Technology, Chicago, IL (USA)). Feb 1981. Contract AC21-76ET10520. 208p. NTIS, PC A10/MF A01.

The objective of the program described was to develop a noncatalytic process for the hydropyrolysis of lignite and coal to produce high-octane blending gasoline constituents, methane, ethane, and carbon oxides. The process would operate in a balanced plant mode, using spent char to generate process hydrogen by steam-oxygen gasification. The technical program included the construction and operating of a bench-scale unit (5-10 lb/hr), the design, construction, and operation of a process development unit (PDU) (100 lb/hr), and a final technical and economic assessment of the process, called Riser Cracking of Coal. In the bench-scale unit program, 143 runs were made investigating the effects of pressure, temperature, heating rate, residence time, and particle size, processing North Dakota lignite in hydrogen. Some runs were made in which the hydrogen was preheated to pyrolysis temperatures prior to contact with the coal, and, also, in which steam was substituted for half of the hydrogen. Attempts to operate the bench-scale unit at 1200 psig and 1475°F were not successful. Depth of carbon conversion was found to be influenced by hydrogen pressure, hydrogen-to-coal ratio, and the severity of the thermal treatment. The composition of hydrocarbon liquids produced was found to change with severity. At low severity, the liquids contained sizable fractions of phenols and cresols. At high severity, the fraction of phenols and cresols was much reduced, with an attendant increase in BTX. In operating the PDU, it was necessary to use more oxygen than was planned to achieve pyrolysis temperatures because of heat losses, and portions of hydrocarbon products were lost through combustion with a large increase in carbon oxide yields. Economic studies, however, showed that selling prices for gasoline blending stock, fuel oil, and fuel gas are competitive in current markets, so that the process is held to warrant further development.

15187 **(DOE/ET/13153—4) Short-residence-time hydropyrolysis of coal. Technical progress report, 1 July 1980-31 September 1980.** Saville, D.A.; Russel, W.B. (Princeton Univ., NJ (USA). Dept. of Chemical Engineering). 1980. 14p. NTIS, PC A02/MF A01.

In this quarterly report we update the status of the program to gather kinetic data for the pyrolysis and hydropyrolysis of coal and the combined theoretical and experimental effort to understand the role of plasticity in these processes.

15188 **(DOE/ET/14700—3) Chemistry and catalysis of coal liquefaction, catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, April-June 1980.** Wiser, W.H. (Utah Univ., Salt Lake City (USA). Dept. of Mining and Fuels Engineering). Jan 1980. 75p. NTIS, PC A04/MF A01.

Systematic hydrodeoxygenation (HDO) studies of polycyclic ketones, e.g., 1-tetralone (1) and 2-tetralone (2) were carried out. The change in product composition as a function of sulfided catalyst type, reaction temperature, and contact time were investigated and feasible mechanistic schemes were developed. The hydrodenitrogenation (HDN) of acridine, a compound representative of linear N-containing polycyclics with a middle pyridine ring, was investigated. Results obtained show that at least two aromatic rings in the acridine system must be saturated before removal of the nitrogen atom from the middle ring could be effected. The catalytic cracking of 9,10-dihydronaphthalene was systematically investigated and a feasible mechanistic scheme for the reactions involved was developed. The study demonstrates that conventional zeolite-containing catalysts are ineffective for cracking of a middle hydroaromatic ring, flanked by two aromatic rings. Cracking of a middle hydroaromatic ring with such catalysts is effected only if the ring is flanked by at least another hydroaromatic ring, as in 1,2,3,4,9,10,11,12-octahydrophenanthrene. Studies on the effect of deactivation of commercial $CoMo/Al_2O_3$ catalysts by pyridine poisoning and by coke showed that the remaining active sites were essentially identical in character to those on the fresh catalyst. Thus, deactivation causes loss of some sites, but does not affect the activity of the remaining sites. Pyridine was much more effective in deactivating the catalyst than coke on a weight basis.

15189 **(DOE/ET/14705—15) Bi-gas pilot plant operation. Technical progress report, 1 July 1980-30 September 1980.** (Stearns-Roger, Inc., Denver, CO (USA)). 1980. Contract AC01-80ET14706. 81p. NTIS, PC A05/MF A01.

The stainless steel process gas line from the gasifier to the gas washer was replaced with chrome molybdenum steel. Test G-13 was the longest to date and was characterized by smooth start-up and operation, long Stage I thermocouple life, and collection of much material balance data. Stress corrosion cracking in several areas of the process gas line delayed start-up of Test G-14 and a large part of the quarter was spent in replacing this piping. The results of test G-13 are described in detail. Conclusions for the test and recommendation are given, especially for burner modifications, prevention of calcium carbonate deposits, etc.

15190 **(DOE/ET/14881—4) Mechanisms and kinetics of coal hydrogenation. Quarterly progress report, October-December 1980.** Gary, J.H.; Baldwin, R.M.; Bain, R.L.; Furlong, M.W. (Colorado School of Mines, Golden (USA). Dept. of Chemical and Petroleum Refining Engineering). Jan 1981. Contract AC22-79ET14881. 47p. NTIS, PC A03/MF A01.

Colorado School of Mines is engaged in an experimental program to develop comprehensive models for the effects of coal composition upon the kinetics and mechanisms of coal hydrogenation, for the effects of mineral matter additives (disposable catalysts) upon kinetics and mechanisms of coal hydrogenation, and for the kinetics and mechanisms of the hydrogenation of coal-derived products such as preasphaltenes and asphaltenes. Safety modifications to the CSM continuous processing unit were completed to shield the control room from the gas and liquid-solid product sampling systems. A mass balance analysis of sample validity was begun. All but two of sixteen coals in the suite of coal reactivity study coals have been run. Computer modelling of proposed reaction networks was started. Initial efforts at coal property versus reactivity correlations were begun. Feed material preparation for the asphaltene hydrogenation study was completed, and preliminary testing of the reactor system was begun. The experimental portion of the disposable catalyst study screening program was completed. Conclusions are pending statistical analyses of the data.

15191 **(DOE/PC/30075—3) Crossed reaction networks in catalytic hydrodenitrogenation of synthetic liquid fuels. Quarterly report, August 1, 1980-October, 31, 1980.** Satterfield, C.N.; Hsi, S. (Massachusetts Inst. of Tech., Cambridge (USA)). 1980. 14p. NTIS, PC A02/MF A01.

During the third quarter, the following have been accomplished: (1) The trickle bed reactor system has been tested at pressures and temperatures above operating conditions. (2) A suitable carrier liquid for the reaction has been developed by hydrogenation of commercially-available α-olefins. Equipment has been constructed and operated to produce this liquid regularly on a scale suitable for our purposes. (3) Procedures for the gas chromatographic analysis have been tested.

15192 **(DOE/PC/30075—4) Crossed reaction networks in the catalytic hydrodenitrogenation of synthetic liquid fuels. Quarterly report, November 1, 1980-January 31, 1981.** Satterfield, C.N.; Hsi, S. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AC22-80PC30075. 17p. NTIS, PC A02.

The trickle bed reactor system has been brought into operation and sample analysis by gas chromatography has been refined. Whether hitherto unsuspected homogeneous reactions may contribute significantly to the reaction network of quinoline under typical HDN conditions was explored. Details are presented on the following: the automatic shut down system, application of a capillary column in our gas chromatographic analysis, absolute response factors obtained for various compounds in gas chromatographic analysis, thermocracking of liquid carrier under HDN conditions, possibility of 1,2,3,4-tetrahydroquinoline or 5,6,7,8-tetrahydroquinoline acting as a homogeneous hydrogen donor or hydrogen acceptor in the quinoline reaction network, and homogeneous reaction of quinoline under HDN conditions.

15193 **(DOE/PC/30217—T1) Pyrolysis of coal-derived fuels using the laser-powered homogeneous pyrolysis technique. Technical progress report.** de Boer, P.C.T. (Cornell Univ., Ithaca, NY (USA)). 31 Jan 1981. Contract FG22-80PC30217. 18p. NTIS, PC A02/MF A01.

The present investigation concerns the application of the Laser-Powered Homogeneous Pyrolysis (LPHP) technique to the formation of soot precursors during pyrolysis of coal-derived fuels of high carbon-to-hydrogen ratio. This technique is particularly attractive for this purpose. LPHP offers the range of temperatures and heating times required to study the progress of the pyrolysis process. Also, the simplicity of the experimental procedure allows studying many species in a relatively short time. Considerable progress has been made in improving the method of data evaluation, and in developing the method of taking data. A set of equations was derived describing the motion of the strongly heated gas in the sample cell. This set replaces the Boussinesq equations, which are based on the assumption of nearly constant temperature, and used in previous work. A solution scheme for the new set of equations was devised which is no more complicated than the scheme used previously to solve the Boussinesq equations. A set of measurements has been made of the pyrolysis of 1,4-cyclohexadiene. These measurements are serving to establish the validity of the methods used, and are described in Section III. Section IV contains a brief description of the work currently in progress.

15194 **(FE—1545-86) Industrial application of C-E's coal-gasification process. Final report, January 1979-August 1980.** Atabay, K.; Baldassari, M.; Thibeault, P.R. (Combustion Engineering, Inc., Windsor, CT (USA). Power Systems Group). Jan 1981. AC01-76ET10204. 224p. NTIS, PC A10/MF A01.

The technical and economic feasibility of Combustion Engineering's atmospheric pressure, entrained coal gasifier was studied in four specific applications. Selection of the four applications was based on a general analysis of industrial energy requirements. Plant designs were developed and costs estimated for each of the four cases to determine the potential of a clean fuel gas produced from a C-E gasifier as a cost effective substitute for present energy sources or feedstocks. The gasification potential for industry was determined by reviewing the literature for energy demand and how energy is used. It is estimated that the potential for coal gasification in industry is about 5×10^{15} Btu per year. This potential represents about 500 gasification plants at an average capacity of 30×10^{9} Btu per day. Those industries which were identified as having the largest potential are the petroleum, chemical, steel, and paper industries with a combined estimated potential of 4.5×10^{15} Btu/year. Other industries with a sizable potential are the stone, glass, food and metal mining industries. An analysis of the uses of energy indicates that low and medium Btu gas (LBG and MBG) may be used in several ways in industry. In addition to its application in the generation of electrical power, LBG or MBG can be used as alternate fuels for a conventional steam boiler, to produce a clean hot-flue gas or supply heat directly in a chemical process. Under certain conditions, MBG can be used as a chemical feedstock in the production of other products.

15195 **(FE—1784-69) Program to discover materials suitable for service under hostile conditions obtaining in equipment for the gasification of coal and other solid fuels. Quarterly progress report, July 1, 1980-September 30, 1980.** Schaefer, A.O. (ed.). (Metal Properties Council, Inc., New York (USA)). Sep 1980. Contract AC05-76ET10670. 149p. NTIS, PC A07/MF A01.

This Quarterly Progress Report describes the progress on a program under the direction of The Metal Properties Council, Inc., designed to screen materials for use in such plants with respect to the various unique corrosive environments obtaining therein; and, finally, to provide useful corrosion data as well as reliable information on other properties needed for the design, construction and operation of such plants. This program is sponsored by the US Department of Energy and the Gas Research Institute. This report describes the work which is pursued in five phases, each having a distinct testing program. There are additional phases in the overall program of The Metal Properties Council, Inc., having to do with coal conversion. These phases are described in separate reports as covered by contract. A summary of achievements is followed by detailed results of corrosion testing of selected materials.

15196 **(FE—2315-58) Refining and upgrading of synfuels from coal and oil shales by advanced catalytic processes. Quarterly report, July-September 1980.** Sullivan, R.F.; O'Rear, D.J.; Frumkin, H.A. (Chevron Research Co., Richmond, CA (USA)). Oct 1980. Contract AC22-76ET10532. 29p. NTIS, PC A03/MF A01.

This quarterly report includes design improvements for the refining of SRC-II syncrude, hydrocracking experimental results on Wyodak H-Coal syncrude, and estimates of the potential yield of benzene, toluene, and xylene from three coal-derived syncrudes. A distillation column can be eliminated from the proposed SRC-II refining scheme. This reduces the investment by $50 MM and reduces the refining cost by $0.50/bbl. The experimental program on H-Coal syncrudes is complete. Updated analyses on the last task in this program, extinction recycle hydrocracking, are included. The potential yield of benzene, toluene, and xylene from Wyodak H-Coal, Illinois H-Coal, and SRC-II syncrudes is nearly 50%. Slight differences between the yield from the three syncrudes can be accounted for by differences in the properties of the syncrudes.

15197 **(FE—2434-62) Pipeline gas from coal - hydrogenation (IGT hydrogasification process). Quarterly report No. 15, January 1-March 31, 1980.** (Institute of Gas Technology, Chicago, IL (USA)). Dec 1980. Contract AC01-76ET10163. 80p. NTIS, PC A05/MF A01.

Pilot plant operations and related support studies necessary to establish a data base to optimize the HYGAS SNG process design are being performed. Work during most of the quarter was concentrated on plant turnaround activities and on modifications for Test 85. Major effort centered on replacing the refractory in the high-temperature reactor (HTR). Coal crushing and pretreater tests were run with washed Western Kentucky coal to determine its crushing and agglomerating characteristics. As a result, the operating temperature and the superficial velocity were increased to obtain a more uniformly pretreated product. Test 85 began with reactor light-off on March 20, followed by self-sustained steady-state operation beginning March 27. At the close of this quarter, 51 hours of steady-state operation had been logged. Test 85 is currently running and is expected to continue through the first part of April. Ten tests were conducted in the 6-inch process development unit (PDU). Data from the most recent series of pneumatic conveying tests were compared with several published correlations for chokking velocity and lift-line pressure drop. Data from the most recent series of pneumatic conveying tests were compared with

several published correlations for choking velocity and lift-line pressure drop. Inspection of the low-temperature reactor (LTR) and raw-gas primary filter assemblies confirmed the units' efficient removal of fines from the gas sample stream. An ultrasonic survey of the quench tower vessel was completed. Results indicate that no significant loss in wall thickness has occurred in the quench tower carbon steel shell after 9 years of exposure to HYGAS process product gases. Selected sections of the oil and water slurry piping loops were radiographed, and the existing high-pressure cyclone was examined by both radiographic and ultrasonic methods.

15198 **(FE—2621-15) Weld overlaying for corrosion resistance in coal-gasification atmospheres. Final report, August 15, 1977-August 15, 1979.** Sadowski, E.P. (International Nickel Co., Inc., Suffern, NY (USA). INCO Research and Development Center). 1979. Contract AC01-77ET10496. 268p. NTIS, PC A12/MF A01.

Tests by others have indicated that at least 25% chromium is required to obtain long time protection in coal gasification atmospheres at 982°C (1800°F). High aluminum content may also be beneficial for this service. Two nickel-base filler metals designed to deposit high Cr and Cr-Al contents were used to surface Types 303L and 310 stainless steel (SS) and INCOLOY alloy 800H. Single and double layers of high chromium filler were deposited successfully using three weld processes: submerged-acr, gas metal-arc and gas tungsten-arc with a hot wire addition. The compositions of the deposited overlays were affected by the compositions of the filler metal and substrate, the percentage dilution, the percentage recovery of elements across the arc, and the composition of the flux used with the submerged arc welding process. All surfaced substrates had better corrosion resistance than the unprotected substrates when exposed for 1000 hours in a coal gasification atmosphere (CGA) at 982°C (1800°F). The extent of corrosion attack observed on the unprotected substrates indicated that the test conditions were very severe. The different filler metals, substrates or welding processes evaluated did not affect the as-welded room temperature tensile properties of composite specimens of overlay and substrate. The 1000-hour stress rupturere strength at 982°C was, however, affected by substrate and weld process. The highest stress rupture strength was obtained with the INCOLOY alloy 800 H weldments. The room temperature yield and tensile strengths of all weldments decreased after exposure to the CGA.

15199 **(FE—2806-7) Coal gasification pilot plant support studies. Quarterly report, October 1-December 31, 1979.** (Institute of Gas Technology, Chicago, IL (USA)). Oct 1980. 134p. NTIS, PC A07/MF A01.

Coal gasification research programs support gasification pilot plant operations but are not limited to them. As a result programs have been developed to study also chemical reactions in gasification, fluidized bed reactors, processing product and waste gases and improved methods of coal feed preparation. The objectives and technical progress in these areas and, in some cases, subdivisions of them are presented in this report. (LTN)

15200 **(FE—2806-8) Coal gasification pilot plant support studies. Subtask 1-1. Effects of process variables on the initial gasification reactions of noncaking coals. Topical report, April 1978-April 1980.** (Institute of Gas Technology, Chicago, IL (USA)). Dec 1980. Contract AC21-78ET11330. 76p. NTIS, PC A05/MF A01.

The primary objective of this investigation was to develop the necessary fundamental kinetic information needed to predict the yields of devolatilization products during the initial stages of hydrogasification of noncaking coals. 56 devolatilization tests were conducted with three different subbituminous coals: Colorado subbituminous B (CSB), Wyodak (W-38), and Adaville (W-16). All three are low-sulfur, Western coals that were chosen for this study mainly because they are abundant in reserve and have a low O/C atomic ratio. The devolatilization tests were conducted over a temperature range of 800° to 1400°F at 35 atmospheres in either helium or hydrogen. Both isothermal and nonisothermal experiments were conducted. The limiting yield parameters of these coals were obtained from the experimental results using a previously developed procedure. The previously developed kinetic model described the devolatilization behavior of the three coals satisfactorily with respect to CO, CO_2, CH_4, C_2H_6, and H_2O yields. The model was unable to predict the yield of heavy hydrocarbons. Correlations were developed for determining the limiting yields of the oxygenated species, CO, CO_2, and H_2O, from all coals using only the atomic O/C ratio of the raw coal. In general, the kinetic model works well for subbituminous and lignite coals. However, additional work with higher ranked coals will expand the applicability of the model. Also, much effort is needed to improve the prediction of heavy hydrocarbons and oils. Studies aimed at determining the origin of the devolatilization products from the raw coal will be a great help in understanding the mechanism of devolatilization and will doubtedly yield valuable kinetic information.

15201 (FE—2806-16, pp 61-76) **Section II: studies on catalytic ammonia decomposition in the presence of hydrogen sulfide.** Dec 1980.

In Coal gasification pilot plant support studies. Subtask 3-3. Improved methods of removal, recovery, or conversion of sulfur and nitrogen compounds in raw product gases from coal gasification processes.

The catalytic activity of several materials was evaluated to identify catalysts that might be employed in coal gasification-combined cycle power generation plants to reduce the ammonia content of the raw fuel gas. This would aid in minimizing NO/sub x/ formation during subsequent combustion of the fuel gas. The materials evaluated were PtS, Ag_2S, CoS, Fe_2O_3, ZnO, and ZnS. The latter three were included because of their possible use also as high-temperature desulfurization agents. The materials were tested at temperatures between 425 and 750°C, pressures between atmospheric and 350 psig, and feed gas composition ranging from simple NH_3-He mixtures to simulated low-Btu fuel gas excluding trace contaminants. All six catalysts demonstrated significant ammonia decomposition activity under the test conditions. The relative activities of the catalysts based on the number of moles of ammonia decomposed per unit weight of catalysts per unit time are given by $Ag_2S > CoS \sim PtS \sim Fe_2O_3 > ZnO \sim ZnS$. Taking into account the current cost of the various catalytic materials, however, these could be ranked as $Fe_2O_3 > ZnO \sim ZnS > Ag_2S > CoS > PtS$.

15202 (FE—2806-16, pp 77-92) **Section III: studies on catalytic hydrolysis of carbonyl sulfide and hydrogen cyanide.** Dec 1980.

In Coal gasification pilot plant support studies. Subtask 3-3. Improved methods of removal, recovery, or conversion of sulfur and nitrogen compounds in raw product gases from coal gasification rocesses.

Development of a high-temperature catalytic process to hydrolyze COS is beneficial to coal gasification plants, because it can reduce the sulfur content of CO_2 vent-gas streams in coal gasification processes without significant energy requirements. Unfortunately, most known COS hydrolysis candidates are poisoned by one or more of the trace constituents present in coal-derived fuel gases. Catalysts selected for evaluation in this program included the conventional alumina catalyst as well as several new catalysts such as calcium oxide, strontia, magnesia, and beryllia. Several catalysts were prepared by a variation of the impregnation method. The prepared catalysts were tested for COS hydrolysis activity at atmospheric pressure and temperatures between 200 and 450°C. The space velocity in these experiments was about 1000 SCF/hr-ft^3 catalyst using a simple gaseous mixture of carbonyl sulfide, steam, and helium. Only two of the catalysts tested exhibited negligible COS hydrolysis activity. All other catalysts exhibited good COS hydrolysis activity. Most surprisingly, the 99% alumina catalyst exhibited less activity than the other catalysts at temperatures above 250°C.

15203 **(FE—2809-19) Coal gasification pilot plant support studies: summary report. Final report, April 1, 1978-April 30, 1980.** (Institute of Gas Technology, Chicago, IL (USA)). Mar 1981. 21p. NTIS, PC A02/MF A01.

Currently the main emphasis is on the development and demonstration of coal conversion processes. Improvements and simplifications of the overall process are needed, however, to reduce capital investment. In addition, obtaining design data not now available would minimize uncertainties and permit more precise design, which also would reduce the investment. The coal gasification pilot plant support studies developed for this purpose were conducted

separately from the actual pilot plant operation; they wee not restricted by equipment limitations of the pilot plant. The studies were aimed at achieving a better understanding of the process and developing techniques to improve certain process steps. The operation of various pilot plants helped to formulate support study tasks and their objectives. In turn, support studies developed the basis for improving pilot plant operation, achieving the expected conversion, and effecting cost savings. The support studies projects were classified into four tasks: Studies of Gasification Reactions for Improving the Performance of Coal Gasification Reactors, Studies of Fluidized-Bed Reactors in Coal Gasification Processes, Studies to Improve the Processing Techniques of Product and Waste Gases from Coal Gasification, and Studies to Improve Methods of Feed Preparation for Coal Gasification. This report summarizes the objectives and achievements of the subtasks of these 4 tasks. Topical reports have described the equipment and experimental techniques used in detail, the analysis of the data acquired, and the conclusions for the individual program subtasks of this project. These subtask topical reports (FE-2806-8 through -18) are available from the National Technical Information Service, US Dept. of Commerce, Springfield, Virginia 22161.

15204 **(FE—3297-6) Development of unique catalysts for hydrodenitrogenation of coal-derived liquids. Sixth quarterly report, December 15, 1979-March 15, 1980.** Katzer, J.R.; Stiles, A.B.; Kwart, H. (Delaware Univ., Newark (USA). Dept. of Chemical Engineering). 1 Jun 1980. Contract AS01-78ET03297. 49p. NTIS, PC A03/MF A01.

Hydrodenitrogenation of decahydroquinoline has been studied using catalysts prepared by coprecipitation or impregnation of Ni, Mo on magnesium oxide support. Preliminary results show that molybdenum plays an important role in carbon-nitrogen bond scission. The nitrogen removal rates using Mo on γ-alumina support are considerably higher than Mo on magnesia support. More runs have been made using sulfided and unsulfided catalysts. Recent results show that sulfiding of the catalysts does not deactivate them. Catalysts have been prepared and tested with the emphasis on understanding the role of acidity on the carbon-nitrogen bond scission reaction and on direct removal of nitrogen without ring hydrogenation. A comparison of 2% Ni, 2% Mo/$A1BO_3$ catalysts prepared by two different techniques (impregnation and coprecipitation) showed that the catalyst prepared by coprecipitation removed nitrogen more quickly than the catalyst prepared by impregnation. Several Ni, Mo/fluorided alumina catalysts with various levels of fluorine content (to increase the acidity of alumina support) were prepared by a commercial catalyst supplier. Preliminary results from this study indicate that the fluorided γ-alumina catalysts slightly enhanced the hydrogenolysis activity but showed little effect on the hydrogenation activity. Several other catalysts with different acidity function have been prepared and are now being evaluated.

15205 **(IS-T—950) Changes occurring in coal during in situ gasification.** Thompson, G.L. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 128p. NTIS, PC A07/MF A01.

Thesis.

The Morgantown Energy Research Center's simulated in situ gasification experiments combusted lignite and bituminous coals under nearly identical conditions. This permits some conclusions to be made based upon the results and residues from these two different types of coal. Many of the conclusions, however, are inferences based upon the limited data from the analyses of the residues from these three simulated in situ gasification experiments. The investigation utilized several standard coal and coke analysis techniques to chemically, physically, and petrographically characterize the coal and the residues left after its gasification experiments. Additional comparisons of these residues to carbonized coal were made largely because of their visual similarities. These comparisons provide added insight into the changes the in situ gasification residues undergo. The study includes a discussion of the MERC experiments, a literature review of in situ gasification and its component processes, the methods used, results, conclusions and recommendations. Twenty-one specific conclusions are listed. (LTN)

15206 **(LBL—12023) Mechanisms of erosion/corrosion of metals and their oxide scales.** Levy, A.; Bellman, R. Jr.; Maasberg, J. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Dec 1980. Contract W-7405-ENG-48. 28p. NTIS, PC A03/MF A01.

The presence of small particles of coal and char in moving reactive gases at elevated temperatures in coal gasifiers creates a hostile environment that has caused surface degradation of metallic components in pilot plant operations. The objective of the work reported herein is to provide some insight into the basic mechanisms of degradation that occur when a small particle impacts on a bare metal surface or on one that contains a thin oxide scale. It is hoped that understanding how material is removed from the surface will provide the basis for selecting operating conditions and developing more resistant materials that will result in less materials degradation. The work to date indicates that significant differences in erosion behavior do occur as the result of different elevated temperature corrosion conditions forming different scale and interface compositions and morphologies. Generally the differences were relatively minor. However, under conditions of combined erosion-corrosion, these differences could become important. Even though the scales were thin and on ductile matrices, their erosion behavior variation with impingment angle was that of a brittle rather than a ductile material. The use of erosion tests to study the adherence of various scales has some merit. However interpretation of some of the smaller differences could be difficult.

15207 **(ORNL/TM—7638) Corrosion of the wash solvent column at the Fort Lewis, Washington, solvent-refined-coal pilot plant.** Baylor, V.B.; Keiser, J.R.; Leslie, B.C.; Allen, M.D.; King, R.T.; Cooper, R.H. (Oak Ridge National Lab., TN (USA); Sprague Electric Co., North Adams, MA (USA)). Mar 1981. Contract W-7405-ENG-26. 58p. NTIS, PC A04/MF A01.

Solvent Refined Coal (SRC) liquefaction pilot plants have demonstrated the feasibility of converting high-sulfur, high-ash coals into clean-burning fuels. Scaleup to commercial levels of production demands component reliability, which depends on materials performance. Corrosion has been troublesome in the fractionation area of the SRC pilot plants, particularly in the wash solvent column at the Fort Lewis, Washington, plant. To investigate the corrosion problem, activities at ORNL have included on-site metallographic examination, analyses of failed components and surveillance coupons, and laboratory experiments. The mechanism of corrosion is speculated to be the oxidation of iron and nickel to form a soluble iron compound leaving an insoluble nickel sulfide scale. A strong correlation is observed between temperature, corrosion rate, and the nickel content of the alloy. The exact cause of the corrosion is still under investigation but is suspected to include a combination of organic compounds and chlorine.

15208 **Synthetic natural gas from peat.** Rader, A.M. (Minn Gas Co, Minneapolis). *Industrial and Engineering Chemistry, Product Research and Development ;* **18**: No. 4, 291-296(Dec 1979).

U.S. peat resources are estimated at 1443 quadrillion Btu's, second only to coal, and it is equivalent to about 240 million barrels of oil. Peat is a geologically young coal that has been used as a fuel for centuries in Europe. The U.S. has not considered it as a commercial source of energy in the past due to the low cost of other available fuels, but peat has been a significant fuel for electric generation for several decades in Ireland and Russia. Minnesota Gas Company (Minnegasco) began evaluating peat as a new material for production of synthetic natural gas in September 1974. Research and tests indicate that peak can be converted to synthetic natural gas more easily, and at a lower cost, than either lignite or bituminous coal. Present plans indicate that pilot plant hydrogasification tests on peat will be started July 1979 with co-funding by Gas Research Institute and U.S. Department of Energy. 5 refs.

15209 **Limitations on the use of alloys in coal gasifiers for power generation.** Stringer, J. (Electric Power Research Inst., Palo Alto, CA). *Materials amp Components in Fossil Energy Applications ;* No. 31, 2-5(1 Apr 1981).

The mechanism of corrosion involves the transport of sulfur through the oxide followed by internal sulifidation, resulting in the

eventual destruction of the protective scale and rapid corrosion. Post-breakaway rates are rapid and variable, and it is probably unreasonable to design on the basis of them. For uncooled components such as instrumentation wells, the problem is to select an alloy which can achieve a reasonable lifetime; there are limited mechanical strength requirements, and it appears that an alumina-forming alloy with low nickel will be best. The design should permit easy replacement, since at temperatures above 1300 to 1500°F lifetimes of more than a few hundred hours could not be guaranteed. For cooled components, such as heat exchange tubes, the problem is rather to determin the temperature at which reasonable lifetimes can be achieved. A preliminary study on these lines concluded that no commercial available alloy or surface coating is suitable for use in a Texaco-type atmosphere at 1400°F or above. However Ni-46Cr and MCrAl alloys with 25 to 40% Cr and 30 to 40% Al which could be used as claddings appear to have acceptable resistance even as high as 1800°F, although it was noted that interdiffusion with the substrate and thermal cycling may reduce the useful life to the order of 5000 hours or less. An important comment is that the presence of slag or char on the surface may degrade these alloys.

15210 **Transfer of hydrogen by hydroaromatics. 2. The temperature dependence of the rate constants and catalytic site populations in the tetralin/iron catalyst systems.** Gangwer, T.E. (Brookhaven National Lab., Upton, NY). Contract AC02-76CH00016. *Journal of Physical Chemistry, The ;* **85**: No. 5, 575-579(5 Mar 1981).

The heterogeneous mechanism of dehydrogenation for the tertalin/iron catalyst system previously reported is further documented. The temperature dependences of the rate constants are reported. The effective activation energies on these heterogeneous surfaces were found to be in the -20 to +30 kcal/mol range. The catalytic site populations and temperature dependences were used to determine the binding energy, E/sub b/, of the organic reactants at the catalytic sites. The E/sub b/ values were found to be in the 20 to 40 kcal/mol range.

15211 **Materials for coal gasification: effect of environment on stress rupture.** Horton, R.M. (Idaho National Engineering Lab., Idaho Falls). *Materials amp Components in Fossil Energy Applications ;* No. 30, 1-2(1 Feb 1981).

The biaxial stress rupture tests at the INEL were conducted under conditions similar to the uniaxial stress rupture tests at SwRI. The four corrosion resistant alloys tested were Incoloy 800H; Alonized Incoloy 800H; Type 310 stainless steel; Haynes 188, and IN-657. The biaxial stress rupture behavior in the CGA environment was very similar to that in air. Results for two of the alloys, Type 310 stainless steel and Haynes 188, are sown in. The other two alloys show smilar behavior. The rupture parameter, P, is an empirical quantity which reflects the simultaneous effects of both temperature and duration of applied stress on stress rupture. Based on these results, two trends are apparent: (1) the biaxial stress rupture tests show the same trends and approximately the same stress rupture values as uniaxial data obtained from the literature for each alloy tested; and (2) the biaxial strain at rupture was small, typically only a few percent. It is appropriate to mention that in the uniaxial stress rupture testing at SwRI, exposure to CGA generally resulted in a shorter rupture life than with testing in air. No explanation is yet available for the observed difference in behavior between SwRI and INEL test specimens.

15212 **(SAND—81-6003) Process for extracting useful, primarily combustible gases, by in-situ gasification of underground fossil-fuel beds.** Ljuengstroem, F. Feb 1981. Translation of . Swedish Patent 130,291. 7p. NTIS, PC A02/MF A01.

The invention offers a process for overcoming shortcomings, so that the calorie content of the fuel beds can be rcovered in a work-saving and thus economically favorable manner, even if the fuel-bearing beds lie quite deep under the surface or are not very thick. This is achieved essentially in that a smaller portion of the fuel bed is heated electrically and thus brought into a gas-permeable state, whereupon this portion is used to introduce oxygen (air) through the fuel bed, as well as to remove the gases generated by burning the remaining portion of the fuel bed. The process according to the invention is carried out by drilling a group of holes down from the ground surface and inserting electric heating elements in some of them. They feed electrical energy into the fuel bed and induce heating, which creates an advancing front of porous fuel mass. Oxygen (air) is then introduced through one or more of the holes in the group so that the surrounding zones of the fuel bed are made to burn and the combustible gases generated are removed through one or more of the other holes in the group.

15213 **Coal conversion research.** du Plessis, M.P. (Alberta Research Council, Edmonton). *CIM (Canadian Institute of Mining and Metallurgy) Bulletin ;* **74**: No. 826, 81-88(Feb 1981).

In addition to being a primary fuel for power generation, Western Canada's vast resources of lignite and subbituminous coals are potential sources of clean liquid and gaseous fuel, which can be transported, distributed and marketed by existing means. Canadian research effort must be directed to making the best possible use of this coal resource. This involves learning more about the resource and developing or acquiring the most suitable technology. To be prepared for the eventual commercialization of coal conversion processes, research infrastructure and technical competence must be built. With the short lead time available, the combined effort of government and industry is required to face the challenges of bringing coal conversion technology to commercial readiness. The Alberta Research Council has responded to the need by developing a long-range research program. The program which is now being implemented concentrates on hydroliquefaction and hydropyrolysis processes producing liquid products and underground gasification producing heating gas or synthesis gas. The program also involves work in fluidized-bed technology, coal chemistry, and supporting analytical and engineering investigations. A Coal Technology Information Center has been established to acquire and disseminate information on coal research and development.

15214 **Continuous process for conversion of coal.** Knudson, C.L.; Willson, W.G.; Baker, G.G.; Sondreal, E.A.; Farnum, S.A. (to Dept. of Energy). US Patent Application 154,351. 29 May 1980. 19p.

In contrast to the prior art, by a discrete combination of the various features and conditions in accordance with this invention, superior results are obtained in a continous operation. It is an object of the present invention to achieve high and increased conversion of coal to liquid product. Another objective is to achieve the above object with minimal coking or at least without increased coking. A major object is to achieve the other objects in a continous process operation whereby disruptions due to plugging or other depositions are greatly reduced if not obviated. Still another object of the present invention is to achieve a reduction in the amount of solid product or heavy bottoms without a disproportionate increase in gaseous product relative to the distillate liquid product. It is yet another object of the present invention to achieve the above objects and with simplifications in present solvent coal refining processes. Other objectives, advantages and novel features are apparent in the detailed description.

15215 **Ash agglomerates from coal.** Vora, M.K.; Mason, D.M.; Rehmat, A.; Sandstrom, W.A. (Inst. of Gas Tech., Chicago, IL). *Energy Communications ;* **6**: No. 3, 195-210(1980).

The U-GAS process combines a single-stage fluidized bed gasifier with an ash agglomerating mechanism to achieve selective removal of high-ash-bearing material (agglomerates) and high carbon conversions. To date, successful gasification tests have been conducted that achieved carbon gasification efficiencies exceeding 90% with coal and char feeds and ash agglomerates have been produced during test operations conducted with coke breeze, Illinois No. 6 bituminous coal and washed and unwashed Western Kentucky No. 9 bituminous coal. U-GAS process tests have been completed at 60 psia (413 kPa) to produce design data for an Industrial Fuel Gas Demonstration Plant.

15216 **Application of liquefaction processes to low-rank coals.** Willson, W.G.; Knudson, C.L.; Baker, G.G.; Owens, T.C.; Severson, D.E. (US DOE, Grand Forks, ND). *Industrial and Engineering Chemistry, Product Research and Development ;* **18**: No. 4, 297-310(Dec 1979).

The Grand Forks Energy Technology Center and the University of North Dakota researchers are conducting research on the liquefaction behavior of low-rank coals necessary to apply major developing processes to these distinctly different coals. In a 5-lb coal/h continuous process unit, synthesis gas, raw lignite, and anthracene oil solvent were reacted at elevated temperatures in single pass tests in a continuous-stirred tank reactor (CSTR). Product yield fractions were correlated with percent coal in the feed slurry, hydrogen donor (tetralin) concentration, and temperature. The molecular weight of the soluble but nondistillable yield fraction was markedly reduced by increasing temperature. In batch autoclave systems, work has been conducted to establish rates and product distributions from several liquefaction solvents. Two solvents were chosen for subsequent tests aimed at determining the catalytic effects of diverse mineral matter in eight different low-rank coals. 6 refs.

15217 **Utility gas from an agglomerating burner gasifier.** Mink, W.H.; Steedman, W.G.; Tewksbury, T.L. (Battelle, Columbus Lab, Ohio). *Coal Processing Technology ;* **5**: 31-43(1979).

The design of a 25-ton/day (22,675-kg/d) of coal process development unit (PDU), which was installed at Battelle, for further development is described in detail. A description is given of the work and the problems encountered along with a discussion of potential commercialization of the process. The process, also known as the Battelle/Union Carbide Process, is a pressurized two-stage fluidized-bed system involving combustion of coal or char in one fluidized bed and the steam gasification of coal in a separate fluidized bed. The heat for the gasification reaction is provided by circulation of ash from the burner to the gasifier. A key feature of the process is the application of the "self-agglomerating" method of fluidized-bed combustion, which causes the coal ash to be pelletized during combustion. The ash, in pellet form, is a free-flowing inert solid that can be used efficiently as a direct-contact heat-transfer medium. 7 refs.

15218 **Controlling fluidized-bed gasification.** Wohadlo, S.J.; Olson, D.P.; Bair, W.G. (Inst of Gas Technol, Chicago, Ill). *Coal Processing Technology ;* **5**: 107-113(1979).

This study briefly reviews the process, describes its principal features, and discusses the instrumentation techniques utilized for measurement and control of process variables. Level, density, flow, pressure, and temperature are discussed, along with an analysis of their importance in the successful operation of the pilot plant. A flow diagram is presented of the process which uses a multi-zone, fluidized-bed reactor to convert the carbon and volatile matter in coal to methane by direct hydrogenation at operating temperatures of 704/degree/ to 982/degree/C and pressures of 1,000 to 1,500 psig (6,895 to 10,342 kPa). The process-feeds include bituminous coals, as well as noncaking lignite and subbituminous coals. The gas produced in the hydrogasifier reactor is purified and converted to pipeline specifications by catalytic methanation. The hydrogasified char is used for hydrogen production by steam-oxygen gasification in the lower zone of the reactor.

15219 **Entrained-bed coal gasification modeling.** Wen, C.Y.; Chaung, T.Z. (WVa Univ, Morgantown). *Coal Processing Technology ;* **5**: 178-181(1979).

The Texaco synthesis gas generator is a downflow entrained-bed gasifier which is capable of converting various hydrocarbons, such as natural gas, light oils, asphals, coal-water slurries, and molten coal liquefaction residues, into synthesis gas (CO+H/sub 2/). A mathematical model has been developed to simulate the Texaco entrained-bed gasifier using coal liquefaction residues and coal-water slurries as feedstocks. Basic assumptions used in the model are summarized. It is concluded that an increase in the oxygen/fuel ratio significantly increases the carbon conversion. In order to obtain 99% conversion in Texaco's pilot plant gasifier, an oxygen/fuel ratio of at least 0.8 but no more than 0.9 is required using H-Coal residue from Ill. No. 6 coal. An optimal steam/fuel ratio exists to maximize the carbon conversion for a given oxygen/fuel ratio. Such an optimum condition is more pronounced when operating at a low oxygen/fuel ratio: An increase in the steam/fuel ratio increases the H/sub 2/ and CO/sub 2/ concentration, but decreases the CO concentration in the product gas. 4 refs.

15220 **Mathematical modeling of synthane gasifier.** Pukanic, G.W.; Cobb, J.T.; McMichael, W.J.; Haynes, W.P.; Strakey, J.P. (Pittsburgh Energy Technol Cent, Pa). *Coal Processing Technology ;* **5**: 184-190(1979).

The "Synthane" process being developed at the Pittsburgh Energy Technology Center (PETC) is one of several high-Btu gas processes currently under development nationwide. This study deals with the mathematical simulation of the Synthane process development unit (PDU) gasifier and describes utilization of an analytical code and a predictive code. A summary is also presented of two computer codes and calculations. 15 refs.

15221 **Slagging fixed-bed gasifier for lignite.** Johnson, B.C.; Fegley, M.M.; Ellman, R.C.; Paulson, L.E. (US DOE, Grand Forks, ND). *Coal Processing Technology ;* **5**: 193-196(1979).

Test results are described in gasifying lignites in a pilot plant, slagging, fixed-bed gasifier located at the U.S. Department of Energy (DOE) Grand Forks Energy Technology Center (GFETC), Grand Forks, North Dakota. The oxygen-fueled unit operates at pressures up to 400 psig (2,758 kPa). It differs from the commercial dry-bottom gasifier in its method of ash removal. In a dry-bottom process, excess steam is added through a grate, which prevents the ash from slagging. The steam input is reduced to obtain the high temperatures desired to produce a molten ash or slag. As a consequence an increase of 3 to 5 times in gas production per unit bed area is experienced in comparison to a dry-bottom unit. In addition, the amount of liquid effluent produced is significantly reduced. The GFETC slagging gasifier, which has a nominal capacity of 25 ton/day (22,675 kg/d), was designed and operated in the period from 1959 to 1965 to establish operability of the slagging method of ash discharge and to evaluate process parameters.

15222 **Sng from coal by catalytic gasification.** Gallagher, J.E. Jr.; Marshall, H.A. (Exxon Res and Eng Co, Florham Park, NJ). *Coal Processing Technology ;* **5**: 199-204(1979).

The objective of this study is to describe a conceptual design of a commercial-scale CCG (catalytic coal gasification) plant which was completed as part of the predevelopment research program. The unique features of the process can be summarized as follows: (1) All the methane is formed in one reactor, the gasifier; no separate shift and methanation reactors are required. (2) No significant heat input is required to the reactor; the oxygen plant and potential slagging problems from oxygen use are eliminated. (3) No pretreatment is required for caking coals due to the action of the catalyst. (4) Significant future improvements are possible through the development of improved catalysts. The steps involved in developing a study design and economics are discussed. Commercial plant investment is outlined. 4 refs.

15223 **Fluid bed direct hydrogasification of coal.** Feldmann, H.F.; Choi, P.S.; Conkle, H.N.; Chauhan, S.P. (Battelle, Columbus Lab, Ohio). *Coal Processing Technology ;* **5**: 205-210(1979).

The Battelle direct hydrogasification process employs a two-stage fluid bed that is fed with coal catalyzed by a unique treatment process which eliminates the agglomerating properties of the coal. This allows utilization of the coal in fluid beds and increases its gasification reactivity, thus allowing the process hydrogen to be produced at lower cost. The catalytic treatment is a proprietary process which uses a pressurized heated aqueous slurry of coal and CaO to produce a nonagglomerating coal, denoted by the acronym BTC (for Battelle-Treated Coal). The treatment process employs the same components as required for slurry feeding and therefore combines a reliable and economic means of feeding to the 1,000-psig (6,895-kPa) pressure desirable for hydrogasification with catalytic treatment.

15224 **Economics of gasoline from underground coal gasification.** Edwards, M.S.; Ulrich, W.C.; Salmon, R. (Oak Ridge Natl Lab, Tenn). *Coal Processing Technology ;* **5**: 219-225(1979).

A conceptual process design is presented along with cost estimates for a facility producing about 50,000 barrels per day via methanol from synthesis gas from 20,000 daily tons of in-place subbituminous coal consumption.

15225 Instrumentation for advanced coal utilization processes. Managan, W.W.; Raptis, A.C.; O'Fallon, N.M.; Herzenberg, C.L. (Argonne Natl Lab, Ill). *Coal Processing Technology ;* **5**: 1-8(1979).

State-of-the-art instrumentation is reviewed with emphasis on primary sensors that measure mass-flow rates and perform on-line analysis of process streams unique to coal conversion and combustion systems. The in-use instrumentation for mass-flow and on-line process analysis is presented and their operating experience analyzed. 16 refs.

15226 Coal liquefaction succeeds without added catalyst. Rogers, S.E.; Mazzocco, N.J.; Akhtar, S.; Yavorsky, P.M. (US DOE, Pittsburgh, Pa). *Coal Processing Technology ;* **5**: 9-14(1979).

Comparative data are presented for long runs with Kentucky coal, Seams 9-13, with a catalytic fixed-bed (pellets of Co, Mo on alumina) and an inert fixed bed (glass pellets), both at 4,000 psig (27,580 kPa) and 450/degree/C. These data define the effective catalyst life. The data also demonstrate operability of an inert fixed-bed reactor with turbulent upflow for hydroliquefaction of coal to clean fuel oil, with a portion of the whole product used as recycle vehicle oil to feed more coal. Operating results show that the activity of the Co, Mo-on-alumina catalyst in a fixed-bed essentially completely decays within 300 hr of use in continuous coal hydroliquefaction. A fixed-bed reactor system, with turbulent upflow of reactants for vigorous mixing, is capable of long-term, reliable hydroliquefaction of coal without an added catalyst in the bed, as demonstrated by such a run of 1,068 hr duration that produced acceptable fuel oil at high yield. This coal hydroliquefaction system is simple with a relatively short reaction time for high conversion to oil that is fluid at ambient or near-ambient temperatures. 5 refs.

15227 Donor solvent coal liquefaction process. Epperly, W.R.; Taunton, J.W. (Exxon Res and Eng Co, Florham Park, NJ). *Coal Processing Technology ;* **5**: 78-83(1979).

The EDS process is designed to maximize liquid products. The feed coal is crushed, dried, and slurried with hydrogenated recycle solvent (the donor solvent) and fed to the liquefaction reactor in admixture with gaseous hydrogen. The reactor design is relatively simple: an upward plug flow design operating at moderate conditions of 427-482/degree/C and about 2,000 psi (13,790 kPa) total pressure. The reactor effluent is separated by a series of distillation steps into a recycle solvent depleted of its donor hydrogen, light hydrocarbon gases, C/sub 3/-538/degree/C liquids, unconverted coal, and coal mineral matter. The spent recycle solvent is catalytically hydrogenated in a conventional fixed bed catalytic reactor employing "off-the-shelf" hydrotreating catalysts. The light hydrocarbon gases are steam reformed to produce the necessary process hydrogen. Commercial feasibility is discussed. 12 refs.

15228 Coal hydropyrolysis permits product yield variation. Duncan, D.A.; Beeson, J.L.; Oberle, R.D. (Inst of Gas Technol, Chicago, Ill). *Coal Processing Technology ;* **5**: 94-106(1979).

A description is given of the effect of the major operating parameters on product yields and discuss the flexibility in yields that would be available for a coal chemicals plant. Additionally, this study will examine the prospects of this process in different settings such as the gas industry, petroleum refining, and the petrochemical industry. It is concluded that the basic argument for developing coal hydropyrolysis to a commercial reality is that it obtains useful fuel and chemical products from coal in a relatively simple and straightforward way. The products that are naturally yielded by pyrolysis are augmented by the hydrogen atmosphere and the tendency of reactive materials to coke is reduced. No new and difficult operability problems are introduced. On the other hand, this question of marketing multi-products will be considered a stumbling-block by many. 16 refs.

0105 By-products

REFER ALSO TO CITATION(S) 15270

0106 Properties

REFER ALSO TO CITATION(S) 15620, 15850

15229 (DOE/BC/10045—12) Fundamental synthetic fuel stability study. First annual report, May 1, 1979-April 30, 1981. Frankenfeld, J.W.; Taylor, W.F. (Exxon Research and Engineering Co., Linden, NJ (USA)). Feb 1980. Contract AC19-79BC10045. 96p. NTIS, PC A05/MF A01.

This report covers the first year of multi-year program to study the effects of nitrogen compounds on the storage stability of synthetic fuels derived from oil-shale and coal. A variety of organic nitrogen compounds were evaluated for their tendencies to promote sediment in hydro carbon fuels under accelerated storage conditions. Three diluents were employed: pure n-decane, petroleum derived JP-8, and No. 2 diesel fuel. The fuels and fuel mixtures were stored at 110°F (43.3°C) and 150°F (65.5°C) in the dark. The most deleterious species to fuel stability were found to be alkylated heterocyclic nitrogen compounds. The most reactive compounds were those with two or more alkyl groups, at least one of which was situated on a carbon adjacent to the nitrogen. A highly deleterious, compound is 2,5-dimethyl-pyrrole (DMP). Other nitrogen compounds, such as amines, amides and non-alkylated heterocycles were found to interact with deleterious nitrogen compounds to promote sediment formation. With the exception of sulfonic acids, none of the sulfur or oxygen compounds studied produced sediment when tested by themselves.

15230 (DOE/ET/10482—12) Development of instrumental methods of analysis of sulfur compounds in coal process streams. Twelfth quarterly technical progress report, July-September 1980. Jordan, J. (Pennsylvania State Univ., University Park (USA). Dept. of Chemistry). Oct 1980. Contract AS0I-77ET10482. 26p. NTIS, PC A03/MF A01.

In the extension and refinement of thermodynamic survey and construction of pourbaix diagrams, when warranted by slow kinetics, specified moieties can appropriately be eliminated from consideration while assuming attainment of equilibrium between all other species. In the voltammetric methods development, it was found thaat tetrathionate can be quantitated by differential pulse polarography at the dropping mercury electrode. In the enthalpimetric methods development, sulfide can be determined by titration with standard thallous nitrate to a thermometric endpoint. The Tl_2S precipitated does not interfere in the subsequent acidimetric titration of Bronsted-base moieties, such as sulfite, carbonate and hydroxide. Generally, liquefaction by-product water samples are characterized by more negative redox potentials than their gasification counterparts. This reflects a preponderance of sulfidic sulfur versus thiosulfate. In gasification by-product waters, the situation is reversed. Cartesian displays of pH-redox potential correlations were constructed, revealing distinct patterns which clearly illustrate the difference between liquefaction and gasification by-product water samples.

15231 (DOE/ET/10482—13) Development of instrumental methods of analysis of sulfur compounds in coal process streams. Quarterly technical progress report for October-December 1980. Jordan, J.; Stutts, J.D.; Ankabrandt, S.J.; Stahl, J.; Yakupkovic, J.E. (Pennsylvania State Univ., University Park (USA). Dept. of Chemistry). Jan 1981. Contract AC22-77ET10482. 25p. NTIS, PC A02/MF A01.

Work is in progress on the preparation of a user-oriented computer software manual, for estimating sulfur speciation in aqueous coal process streams form a thermodynamic data base. Capabilities and limitations of sulfide and polysulfide analysis by differential pulse polarography at a dropping mercury anode are assessed critically. Thallous nitrate used as the titrant reagent in a thermometric enthalpy titration yields the molar sum of monosulfide and polysulfide. Inorganic sulfur has been successfully speciated in coal conversion by-product water samples. A combination of differential pulse voltammetry, thermometric enthalpy titrations and classical

methods was used. One hundred percent of the total sulfur present was quantitatively accounted for.

15232 **(DOE/PC/30231—T1) Sorbate characteristics of fly ash. Semi annual progress report.** Liskowitz, J.W. (New Jersey Inst. of Tech., Newark (USA)). 1980. Contract FG22-80PC30231. 19p. NTIS, PC A02/MF A01.

This one year investigation is concerned with relating the sorbent characteristics of fly ash produced from test coal obtained from 19 mines located in Virginia, West Virginia and Pennsylvania. Six of the test coals and their respective fly ashes have been sampled and boiler conditions monitored in P.S.E. and G. coal fired boilers operated under minimum, intermediate and full power. Major, minor and trace elemental analysis as well as Mossbauer spectra of three of the coals and their respective ashes have been completed. The atom composition of the surface of these fly ashes has also been determined by ESCA. The pH and concentration of the major, minor and trace elements that leach out of the fly ash initially have been determined on the fly ashes produced from the Militant, Deep Hollow and Wellmore Cactus coals. All leachate samples to date exhibited an acidic pH. This leaching essentially ceases as the pH approached neutral conditions. This was found to occur after 4 liters of water was passed through each fly ash sample in a lysimeter. The lysimeter studies to define the sorbent characteristics of the fly ashes have not been completed yet.

15233 **(DOE/PC/30237—T1) Petrology of Cretaceous coals from northwestern Alaska. Semi-annual progress report, September 1, 1980-August 31, 1981.** Rao, P.D. (Alaska Univ., Fairbanks (USA)). 1 Mar 1981. Contract FG22-80PC30237. 12p. NTIS, PC A02/MF A01.

Coal of the Cretaceous age from northwestern Alaska has been sampled, crushed and pelletized for reflectivity measurement and petrographic examination. Reflectance measurements have been completed on 21 samples. The samples (300) were obtained from seismic shotholes, Auger holes, test wells and by channel sampling. (LTN)

15234 **(FE—1231-21) Design optimization in underground coal systems. Volume III. Structural characterization of coal. Final technical report as of February 28, 1981.** (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mining and Minerals Engineering). Feb 1981. Contract AC01-76ET10722. 272p. NTIS, PC A12/MF A01.

Although it appears to be a simple concept, the uniaxial compressive strength is a rather complex parameter and much influenced by a broad range of variables, most of which are extremely difficult to isolate and quantify. During the investigation, an extensive number of specimens, representing 14 major coal seams in the nation, were tested and the following results were obtained: coal strength is dependent upon the loading rate, recommended range 50 to 150 psi/sec; results indicated a random distribution of uniaxial compressive strength regarding the moisture content; the elastic modulus appeared to be independent of the specimen size; given equivalent areas and W/H ratios, a difference existed between the strengths of cubical and cylindrical specimens; and when applied to the Holland-Gaddy pillar design equations, this strength difference can substantially alter pillar sizes and hence the extraction ratio. Based on this research effort, a procedure was developed for modifying the traditional pillar-design equation so that it may be used in conjunction with drill-core strength data. An example is presented to illustrate the application of this approach. Such a procedure may prove invaluable when developing new mining properties for which cubical coal samples are not available.

15235 **(NBSIR—80-2124) Slag characterization: viscosity of synthetic coal slag in steam.** Brower, W.S.; Waring, J.L.; Blackburn, D.H. (National Measurement Lab. (NBS), Washington, DC (USA)). Oct 1980. Contract AI01-76PR06010. 32p. NTIS, PC A03/MF A01.

A rotating cylinder apparatus has been designed and constructed for measuring the viscosity of molten slags under steam pressure in the range 15 to 300 psi and up to about 1400°C. Two synthetic coal slags, one high in alkali and the other lower in alkali but higher in calcia were studied with this apparatus. In the high alkali slag equilibrium was probably not achieved and the viscosity appeared to increase with time. In the low alkali slag although the viscosity appeared to be increased with increasing steam pressure the ambient and higher pressure curves appear to tend to coalesce with increasing temperature.

15236 **(ORNL-tr—4722) State-of-the-art analysis and methods of studying the molecular structure of coals.** Nesterenko, L.L. Translated from *Khimiya Tverdogo Topliva (Leningrad) ;* No. 4, 6-32(1969). 58p. NTIS, PC A04/MF A01.

Summing up, it is necessary to note that the molecular structure of sapropelic and liptobiolytic coal substances in general has been significantly less studied than the organic substances of humites. In the table an attempt is made to compare some of the structural characteristics and properties of the main micropetrographic constituents of humus pit coals as elucidated by the research data of various authors. The problems considered in this report are exceptionally complex and varied and therefore could not be discussed sufficiently thoroughly. Nevertheless, this brief survey of the state-of-the-art with respect to the knotty problem of the molecular structure of coal substances and the critical analysis of a number of papers and concepts obviously can provide a basis for beginning collective fundamentals and comprehensive discussion of both the problems stated in this report and those which will be advanced during the course of the discussion. Most of the papers reviewed are of Russian origin but papers by D. van Krevelen, I.G.C. Dryden, P.H. Given and a few other non-Russian authors areo included. (LTN)

15237 **(ORNL-tr—4723) Problem of the molecular structure and the structural chemistry of natural coals.** Kasatochkin, V.I. Translated from *Khimiya Tverdogo Topliva (Leningrad) ;* No. 4, 33-48(1969). 31p. NTIS, PC A03/MF A01.

The data presented graphically illustrate the higher reaction capacity of the peripheral part of the carbon substance, the process of breakdown of which accompanies primary decomposition. Chemical changes of the nuclear part (growth of carbon layers) occur at a higher temperature (~ 500°) and are responsible for reactions of secondary dissociation with higher activation energy. The marked difference in reaction capacity of the peripheral and nuclear parts of the structure is a distinguishing feature of natural coals, in which their unique chemical history is clearly reflected. There are many other equally illuminating examples of the chemical behavior of coals with respect to reactions of oxidation, hydrogenation, thermal dissociation, etc. We stress the difficulty in interpretation of the facts observed from the point of view of structural schemes in which the polymeric structure of the carbon substance is not reflected. Materials from structural chemical research based on studies of the genesis, solvolysis, hydrogenation, oxidation, and pyrolysis of coals convincingly confirm the polymeric nature of the chemical structure of natural coals. The properties of transitional forms of carbon depend upon the relative composition of hybrid varieties of the atoms and their polymeric combinations. The recent accumulation of experimental material from the study of the structure and properties of different carbonaceous materials and natural coals and progress in the development of methods for detailed quantitative study of the structural components of the nuclear and peripheral parts of carbon substance ensure further and more detailed clarification of the molecular structure and properties of natural coals.

15238 **(ORNL-tr—4724) Physical and physical-chemical methods of studying the molecular structure of coals.** Larina, N.K.; Kasatochkin, V.I. Translated from *Khimiya Tverdogo Topliva (Leningrad) ;* No. 4, 49-76(1969). 69p. NTIS, PC A04/MF A01.

The list of methods and discussion of the possibilities of their application to the study of the molecular structure of the pit coals could be extended, but are limited by the scope of this report. It was primarily of interest to discuss the direct methods of studying the chemical structure of coals and the most recent methods which have not become sufficiently widespread. Valuable information about the structure of coals can also be provided by such methods as determination of the reflectivity and refraction, which are described by Van Krevelen. Kinetic studies are the most fruitful for investigating the reaction characteristics of coals and the nature of the substances of which coal is made. Studies of the fractionation of

coal products using the most varied methods (vacuum distillation, solution in various solvents, chromatography, electrophoresis, and so on), the study of the molecular weights of coal extracts, thermochemical studies, electrophysical methods and many others providing direct or indirect data on the molecular structure of coals are of great interest for coal science. Each of the enumerated methods could be the subject of a separate report. A number of methods have been omitted because they have already become traditional in coal science. We have tried to demonstrate the broad possibilities of physical and physical-chemical methods for analysis of the molecular structure of solid mineral fuels by discussing of a few methods of investigation. The primary thrust involved physical methods. The purpose was to study the chemical structure of the investigated substances, and more than one method combined with mandatory use of chemical analysis data were used in the majority of the referenced papers.

0108 Waste Management

REFER ALSO TO CITATION(S) 15232, 15235, 15631, 15632, 15977

15239 **(BM-RI—8501) Characterization of residues from selected coal conversion processes.** Martin, E.; Sullivan, G.V. (Bureau of Mines, Tuscaloosa, AL (USA). Tuscaloosa Research Center). 1980. 16p. Department of the Interior, Washington, DC.

As part of the Bureau of Mines subactivity in secondary resource recovery and to expand the Nation's mineral base, the Tuscaloosa Research Center made characterization and preliminary beneficiation studies of the waste residues from various coal-conversion processes: from pilot plant tests of the Synthane process for coal gasification, the Synthoil process for coal liquefaction, and the solvent-refined coal (SRC) process for sulfur removal from coal. Those coal conversion processes selected for study were based on the availability of pilot plant samples. Physical, chemical, and mineralogical examinations of the wastes made to determine the mineral content prior to physical beneficiation tests indicated that in addition to significant quantities of carbon, some trace elements offer potential for concentration. All the coal-conversion residues examined were similar chemically and mineralogically. Large quantities of carbon and traces of Ag, Ni, and Pb were present in all of the residues. Beneficiation of the residues produced some carbon and trace-element concentration. The residues responded to beneficiation in differing manners, which suggests a difference in physical properties. Because of its large surface area, the Synthane residue may be useful in treating mine water.

15240 **(DOE/PC/30233—T1) Treatment of coal-conversion wastewater with the powdered activated carbon-contact stabilization activated-sludge process. First semiannual technical progress report, August 1, 1980-January 31, 1981.** Suidan, M.T.; Pirbazari, M.; Gee, C.S.; Deady, M.A. (Illinois Univ., Urbana (USA). Dept. of Civil Engineering). 1981. 23p. NTIS, PC A02/MF A01.

The treatment of coal conversion wastewaters has traditionally been accomplished through the use of the activated sludge process and its various modifications. General observations have been that phenol was degraded efficiently; however, very poor removal efficiencies of thiocyanate, cyanide, and ammonia were obtained. The addition of powdered activated carbon (PAC) to the activated sludge process has been reported to result in a number of distinct advantages. Generally, however, improving the effluent water quality beyond the capabilities of conventional biological treatment and enhancing the treatability of wastewaters that inhibit or toxify biological treatment systems are the primary objectives of utilizing PAC in secondary biological treatment. The focus of the present research project is to assess the effectiveness of the powdered activated carbon-contact stabilization activated sludge process in the treatment of a coking wastewater. The purpose of the contact tank in such a process will be to provide sufficient time for the adsorbable constituents of the coking wastewater to adsorb onto the PAC. The liquor leaving the contact tank is then clarified with the concentratrated underflow receiving treatment in the stabilization tank. After stabilization the sludge is returned to the contact tank. The clarifier supernatant is then nitrified in an activated sludge-type nitrification process and the nitrified effluent is subsequently denitrified in an anoxic filter.

15241 **(IS-T—919) Chlorination of aluminous material to produce aluminum chloride.** Chen, C.S. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 63p. NTIS, PC A04/MF A01.

Thesis.

The fly ash from bituminous coals contains about 20% alumina and 16% iron oxide by weight. Recovery of these metals would provide an alternate source to the ores now used. The alumina and iron materials in fly ash are recoverable by high temperature chlorination. The chlorination of oxides in fly ash in the presence of carbon would produce all chlorides including $SiCl_4$. An attempt to suppress chlorination of SiO_2 by including $SiCl_4$ in the chlorine stream was done. With an addition of $SiCl_4$, the chlorination of SiO_2 was suppressed to a certain degree. However, this resulted in some decrease in the amount of alumina removal. The optimal conditions for suppression of SiO_2 without appreciable effect on chlorination of alumina were reached at 900°C and 172 mm Hg of partial pressure of $SiCl_4$.

15242 **(IS-T—920) Chlorination of fly ash and bentonite with a gas mixture of silicon tetrachloride and chlorine.** Yuan, P.C. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 76p. NTIS, PC A05/MF A01.

Thesis.

This study examines the aluminum removed from power plant fly ash by high temperature chlorination in the presence of silicon tetrachloride. The study undertakes to determine the degree that silicon tetrachloride in the chlorinating gas stream could suppress chlorination of silicon dioxide without appreciably affecting the chlorination of alumina. It was found that higher partial pressure of silicon tetrachloride and higher reaction temperatures suppressed chlorination of silicon dioxide. When there was not sufficient carbon present to combine with all the oxygen, silicon tetrachloride suppressed chlorination of silicon dioxide to a greater degree.

15243 **(IS-T—947) Recovery and separation of products from the high-temperature chlorination of fly ash.** Weiss, S.J. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 73p. NTIS, PC A04/MF A01.

Thesis.

Current information on aluminous chlorination processes, products and separation technology are analyzed so that a meaningful process design can be developed. To that effect, two applicable separation schemes, anhydrous separation process, and aqueous separation process for alumina recovery, are proposed and discussed. From the standpoint of certainty of success alone, it is the author's judgement that the aqueous system is the superior process for alumina recovery. However, the aqueous process, while more conventional than the proposed anhydrous process, may consume more energy than the latter, since evaporation and thermal decomposition of hydrated products is incorporated in the former. In addition, chlorine, readily recoverable from anhydrous products, is virtually forfeited in the aqueous process. The proposed anhydrous process, while incorporating some untested process steps, requires fewer process steps, allows for chlorine recovery, and may require less energy. in addition, the anhydrous $AlCl_3$ produced by this process can be used directly in a reduction cell which requires significantly less energy than a conventional Hall cell. It is felt that the anhydrous process, though unconventional in appearance, will be, if developed, the preferred method of product recovery. Clearly a more detailed comparison of these processes, including an economic analysis comparing the two, is called for.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 15262, 15404, 15850, 16080, 16126, 16213, 16216

15244 **(CONF-7904162—1) Competition as a control for Halogeton glomeratus.** Cleaves, D.T.; Taylor, J. (Argonne National Lab., IL (USA)). 1979. Contract W-31-109-ENG-38. 15p. NTIS, PC A02/MF A01.

From 55. annual meeting of the Colorado-Wyoming Academy of Sciences; Durango, CO, USA (25 Apr 1979).

During the 1978 growing season, preliminary sampling was initiated to determine the effectiveness of perennial vegetation in the control of Halogeton glomeratus, through competition. The study was originated to determine possible alternative methods of control other than spraying with 2,4-D, which eliminates all broad-leaved vegetation on the treated site. Prior studies have indicated that competitive control could be the most beneficial. At the Jim Bridger Mine in southwestern Wyoming, native stands of Artemisia tridentata, Atriplex confertifolia, A. gardneri, and other shrubs adjacent to heavily infected minespoils have successfully prevented the establishment of Halogeton. First year sampling of two minespoil treatments, one with 7.5% cover of native perennials and the other with 1.2% cover of native perennials yielded 199.8 g/m^2 and 327.4 g/m^2 of Halogeton (oven dried weight) respectively. Nearby stands of native vegetation had 22.8% cover of shrubs and yielded only trace amounts of Halogeton (attributed to edge effect and the continued trampling of the area by investigators).

15245 **(LA—8578-MS) Preliminary assessment of environmental, health, and safety issues in coal liquefaction.** Gutschick, V.P. (Los Alamos Scientific Lab., NM (USA)). Oct 1980. Contract W-7405-ENG-36. 56p. NTIS, PC A04/MF A01.

Preliminary quantitative estimates are derived for hazards, both to workers and the general public, which would arise from deploying various technologies of coal liquefaction. The total fuel cycle, from resource extraction through end-use of fuels, and the quantities of hazardous agents generated per unit of end-use energy are considered. Particular attention is paid to airborne emissions of nitrogen oxides, sulfur oxides, carbon dioxide, and particulates; carcinogenic hydrocarbons in bulk fuel, in process wastes, and in exhaust streams from combustion of the fuel; pollutants degrading water quality; and water and land use. Noted are specific characteristics of coal and of liquefaction that temper the rates of pollutant emission per unit of end-use energy, and some quantitative measures of relative risks and benefits are proposed. In general, coal liquefaction is predicted to increase pollutant emissions significantly, although indirect liquefaction via Fischer-Tropsch or Mobil processes is relatively clean. Carbon dioxide appears to be the most significant long-term impact, principally because the modest increase in CO_2 emission rate caused by liquefaction may disproportionately increase the difficulty of phasing out global CO_2 emissions if such reduction can be demonstrated to be necessary to prevent climatic degradation. Land use and water use by liquefaction, which is currently of public concern, is estimated as locally significant but not critical. Liquefaction would bring a few new occupational hazards such as metal carbonyl emissions; relative to alternative energy technologies, it would increase some conventional occupational hazards while decreasing others. Total occupational hazards would be less significant than the public hazards already noted.

15246 (PNL—3700(Pt.2), pp 127) **Power plant fuel conversion environmental impact assessment.** Watson, D.G. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The Department of Energy's Economic Regulatory Administration is responsible for administering a program that prohibits or reduces the use of petroleum and natural gas as the primary energy source in existing or new power plants. Prohibiting the burning of oil and natural gas is expected to result in the increased use of alternative fuels and a related potential for affecting the quality of the human environment. Coal is a logical alternative to oil for many of the boilers being considered for conversion because of its abundance in the United States and due to the fact that some of the boilers were originally designed to burn coal. Some of the more significant potential environmental impacts from coal combustion are the degradation of air quality resulting from increased emission of sulfur dioxide, particulates, and other combustion products, and the disposal of ash and solid wastes from pollution controls.

15247 **Groundwater quality near an underground coal gasification experiment.** Campbell, J.H.; Wang, F.T.; Mead, S.W.; Busby, J.F. (Univ of Calif, Lawrence Livermore Lab). *Journal of Hydrology ;* **44**: No. 3-4, 241-266(Dec 1979).

Groundwater sampling and analysis have been carried out at the site of an underground coal gasification experiment conducted near Gillette, Wyoming. Water from more than 12 wells in the vicinity of the experiment has been sampled before, during, and up to 25 months following gasification. Water samples were analyzed for a variety of characteristics, including the presence of 70 inorganic species, phenolic materials and volatile and semi-volatile organics. The paper reports a greatly increased concentration of organic materials, particularly phenols, just outside the burn boundary and a variety of inorganic species issuing from within the residual ash bed. All detectable contaminants rapidly decreased in concentration with distance, although above-background levels of some materials were detected 30 m from the burn zone within three days of the gasification. Several important contaminants showed a large decrease in concentration with time due, probably, to adsorption. The results suggest a simple physical picture of the development of groundwater pollution near an underground coal gasifier. Refs.

0110 Reserves And Exploration

15248 **(BMFT-FB-T—80-149) Flameproof television camera set for the observation of coal seams and rock strata as well as of tectonic surfaces in underground boreholes. Final report.** Brenken, W.; Wagener, B. (Ruhrkohle A.G., Essen (Germany, F.R.)). Dec 1980. 100p. (In German). NTIS (US Sales Only), PC A05/MF A01.

The method of observation of underground exploration boreholes by means of a flameproof TV camera set successfully passed the trials carried out with Steinkohlenbergbauverein. The available devices are not practical because of their bulkiness (difficult handling, recurring damages during transport, and subsequent breakdowns). The novel design is to ensure higher operational safety, faster standby, more flexibility, more ease of evaluation, as well as adaptation to deeper viz different types of boreholes. A TV camera set comprising smaller structural elements was designed and subjected both to comprehensive tests as well as to practical trials for identification of any weak points. All the components of the TV camera set, including the small cable hoist, fit in one transport case which minimizes the risk of damages during transport. Since the dimensions of the casings were reduced, they can be rapidly placed at the borehole mouth. The cable hoist allows a constant speed of introduction/withdrawal. More ease of evaluation was provided for by inserting a data line in the image and by storing the borehole image on video tape. A compressed air-operated cable hoist as well as 66 bar test pressure on the probe sleeves allow an observation of boreholes as deep as 600 m. Borehole television is a simple and economic means of exploration ahead of coal faces in order to safely complete information on deposits. The observation of boreholes of more than 600 m depth requires different technologies which are to be developed and tested in a subsequent project.

15249 **(DOE/ET/10159—T6) Peat prospectus.** (UOP, Inc., San Diego, CA (USA); SDC Integrated Services, Inc., San Diego, CA (USA)). Jul 1979. Contract AC01-78ET10159. 86p. NTIS, PC A05/MF A01.

This publication contains a general discussion on the origin, distribution, harvesting, dewatering and energy applications of peat. Methods for the gasification of peat are briefly described. The environmental impacts are discussed. Also presented is a description of the Department of Energy program in peat gasification. (DMC)

15250 **(EPRI-EA—673(Vol.1)) Coal resource information. Volume 1. Coal resource information requirements. Final report.** Eyster, J.M.; Klein, D.E.; Walton, D.R. (ICF, Inc., Washington, DC (USA)). Dec 1980. 99p. NTIS, PC A05/MF A01.

This report describes the results of Task 1 of a multifaceted project to catalogue and evaluate coal resource information. This report identifies the coal resource information required by producers and users of coal. Coal resource information, in the context of this project, is defined as data on in situ coal resources (e.g., seam

thickness, hydrologic data, and depth of overburden) and the physical and chemical properties of coal (e.g., proximate analysis, sulfur composition, and grindability) which affect its mineability or usability. The report includes all data necessary for each of seven categories of production and use: (1) extraction; (2) beneficiation; (3) transporting, loading, and storage; (4) carbonization; (5) combustion; (6) gasification; and (7) liquefaction. The findings are the outcome of a 1977 survey of experts in all areas of coal production and use. In all, 42 completed questionnaires were received and analyzed. The usefulness of traditional forms of coal resource data was confirmed. However, in addition to such items as proven reserves, proximate analysis, and calorific value, a host of other information requirements was given high priority by producers (e.g., hydrology data, methane content, and roof stability) and by users (e.g., grindability, ash fusibility, trace element analysis, and size stability). Because there is no single answer to the question of how much coal resource information is needed, a principal conclusion of the study is that a sound coal resource data base must be able to change to meet users' requirements as those data requirements are better identified and modified.

15251 **(EPRI-EA—673(Vol.2)(Pt.1)) Coal resource information. Volume 2, part 1: reviews of major resource studies and ongoing research. Final report.** Eyster, J.M.; Klein, D.E.; Walton, D.R. (ICF, Inc., Washington, DC (USA)). Dec 1980. 144p. NTIS, PC A07/MF A01.

This volume - Part 1 - presents critical reviews of selected major research studies of US coal resources. The reviews and listings are developed from materials collected through 1977 and early 1978. The reviews cover both published and ongoing research reports, divided into General, National, Regional, and Coal Quality categories. Documents collections published in series format by the US Bureau of Mines or the US Geological Survey are reviewed. Each review provides a summary of the information in the document, a clear statement of the intended purpose(s) of the study, and a critical judgment as to how well that purpose was executed. Liberal use of tables, maps, and other illustrations from the documents themselves gives further insight into the content of the report under review. All publications are approached from the viewpoint of a coal researcher seeking reference tools; critical judgments of the value of a document depend largely on its usefulness to such a researcher. The listings of ongoing research projects are organized by state headings, with the additional heading of United States for studies whose geographic scope is larger than a single state. Each entry provides the essential bibliographical information as to author, sponsoring organization, title, and approximate dates of the project. Following this, the listing presents a brief paragraph description of the substance of the project. The overall aim of these listings is to bring the bibliographical effort as much up-to-date as possible by including reports still in preparation.

15252 **Coal exploration. Volume 2.** Argall, G.O. Jr. (ed.). San Francisco, CA; Miller Freeman Publications, Inc. (1979). 560p. (CONF-7810256—).

From 2. international coal exploration symposium; Denver, CO, USA (Oct 1978).

The second international coal exploration symposium was held at Denver, Colorado, USA, October 1978. Twenty-four papers from the proceedings have been entered individually into EDB. (LTN)

15253 **Evaluation of the methane gas content of coalbeds: part of a complete coal exploration program for health and safety and resource evaluation.** Diamond, W.P. (Bureau of Mines, Pittsburgh, PA). pp 211-228 of Coal exploration. Volume 2. Argall, G.O. Jr. (ed.). San Francisco, CA; Miller Freeman Publications, Inc. (1979).

From 2. international coal exploration symposium; Denver, CO, USA (Oct 1978).

The explosion hazard of methane-air mixtures has become an increasingly serious problem in mine planning. As mining progresses to greater depths or develops in new, previously unmined areas, an advance assessment of methane gas potential can be essential for a safe and economic mine development program. The US Bureau of Mines, as part of its Coal Mine Health and Safety Program, has developed a simple, inexpensive test to accurately measure the methane content of coal samples obtained from exploration cores. The gas content of the coal per unit weight determined by this direct method test can be used as a basis for a preliminary estimate of mine ventillation requirements and to determine if degasification of the coalbed in advance of mining should be considered. The test results can also be used to estimate the methane resources of coalbeds in specific geographic areas. With the eventual decline in conventional domestic gas production and increased price of natural gas, commerical production of coalbed gas will become a reality.

0120 Mining

REFER ALSO TO CITATION(S) 15234, 15303, 15319

15254 **(BMFT-FB-T—80-130) Development of a computer-aided method for the techno-economic evaluation of R and D projects in the mining area. Stage I: development of the concept and identification of application. Final report.** Hess, P.; Schaude, G.; Schneider, W.; Hellermann, E. (Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)). Dec 1980. 158p. (In German). NTIS (US Sales Only), PC A08/MF A01.

The work was completed in May 1978. The objective of this project was to describe functional, volume and cost structures and, as far as possible, to establish company-specific characteristics which would enable the impacts of R and D projects to be evaluated quantitatively. The work was started from the assumption that the evaluation must be based on the problem solutions to be achieved with the R and D projects in question and the impacts to be expected in the user area. Due to the large number of impacts to be assessed, a multi-dimensional evaluation method had to be used. The Battelle team therefore used a method of utility value analysis. The report includes a catalog of further steps required before a complete evaluation instrument can be introduced.

15255 **(DOE/ET/13347—1) Alternative oxidizers for strip coal mine blasting agents.** Sudweeks, W.B.; Collins, T.K. (IRECO Chemicals, Salt Lake City, UT (USA)). 14 Mar 1979. 75p. NTIS, PC A04/MF A01.

Since ammonium nitrate manufacture is dependent on natural gas, a shortage in natural gas could lead to a critical shortage in coal by limiting the availability of ammonium nitrate for blasting. The purpose of this study was to assess the future availability of ammonium nitrate and to evaluate the potential of alternative oxidizers not dependent upon natural gas for use in blasting agents. Increased storage capacities and rapidly increasing levels of relativey cheap imported ammonia appear to ensure the availability of adequate levels of ammonium nitrate in the near future. In the longer time frame, rising energy costs have increased the potential for basing ammonia production on alternative sources of hydrogen as well as obtaining natural gas from relatively unlimited unconventional sources. While still somewhat uncertain, such unconventional sources appear to have sufficient potential to ensure the availability of ammonium nitrate even long term. However, there are several oxidizers that could be considered as possible replacements for ammonium nitrate if needed. After a critical evaluation two possible alternatives are recommended for further study: the use of sodium nitrate as a partial replacement and the development of a new type of blasting agent based upon water as the main oxidizer.

15256 **(FE—1231-20) Design optimization in underground coal systems. Volume II. The RESERV-COAL program. Final technical report, February 28, 1981.** (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mining and Minerals Engineering). Feb 1981. Contract AC01-76ET10722. 84p. NTIS, PC A05/MF A01.

The purpose of this research effort was to rewrite the algorithm for calculating areas contained inside given mining boundaries. The computation has proven to be accurate irrespective of the shape of the mining boundaries or property. The program is designed to compute the area inside a single mining tract and multiple mining tracts, and areas must be treated separately. Extensive testing of the algorithm has not indicated flaws, and the user manual has been upgraded to reflect the revised program. The major application of the research effort will be directed to computing the total

area of reserves inside a specified mining boundary as well as computing the total tonnages from a number of mining areas. Also included, is a capability for determination of the tonnages involved with specific characteristics or specifications of sulfur, BTU, percent reject, and ash values. The computer program appears to be an excellent tool for computing reserves of tabular deposits such as coal. The calculation of reserves with any parametric designation or specification will permit evaluations of coal reserves possessing certain major characteristics, which will further enhance evaluation and improved mining design of mining properties.

15257 **(FE—1231-22) Design optimization in underground coal systems. Volume IV. A theoretical yield-pillar design technique using the finite-element method of stress analysis. Final technical report, February 28, 1981.** (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mining and Minerals Engineering). Feb 1981. Contract AC01-76ET10722. 244p. NTIS, PC A11/MF A01.

The purpose of the research was to develop a three-dimensional finite element program to facilitate the design of coal-mine yield pillars that would represent pillar behavior not only during the prefailure elastic stage but also in the postfailure phase. This program was written as part of the effort to facilitate design of longwall face systems especially regarding pillars in the heat and tail entries. Because of the symmetry of the pillar and the massive storage requirements required for three-dimensional work, only a quarter of the pillar was analyzed. The potential of the method may be somewhat limited by the requirements of computer storage of data and long computer execution time. The best potential application will be in the design of yield pillars or yielding zones in conventional mining panels under very deep cover or for head and tail entries in longwall mining systems where pillar loads may become substantial. The application to yield pillars under these conditions may allow even lowering of the roof over the pillar zone with considerable benefits in terms of both roof and floor conditions. The following conclusions were apparent: three dimensional finite element work is costly and time consuming due to the substantial storage requirements necessary in the computer and the long execution time; the program has considerable potential for the design of yielding pillar systems in the centerline layouts of both conventional and longwall mining systems; the testing beyond failure for principal design components has considerable importance in the mine design process; and this approach may be utilized to great advantage under certain conditions.

15258 **(FE—1231-24) Design optimization in underground coal systems. Volume VI. LHDSIM: a load-haul-dump simulator for room-and-pillar mining systems. Final technical report.** (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mining and Minerals Engineering). Feb 1981. Contract AC01-76ET10722. 70p. NTIS, PC A04/MF A01.

The purpose of this research was to develop a computer simulation program for load-haul-dump equipment for use in room-and-pillar mining systems. In addition to the simulation program, a user manual was to have been developed which would enable an engineer to use the load-haul-dump simulator. The results of the research effort was to produce a user guide with literature review and a completed load-haul-dump simulator for use in room-and-pillar mining systems. The simulator is a combination deterministic and stochastic model, and test runs insure its operational capability. The potential application is primarily for equipment selection and evaluation in a load-haul-dump underground mining system with either conventional or continuous mining equipment. The computer program provides an excellent method of evaluating the use of load-haul-dump systems of varying capacity and may be used to compare the productive potential of this method with conventional loading/hauling devices and systems. (1) The computer simulation of a load-haul-dump unit for use in conventional room-and-pillar mining systems is operational; (2) the simulator has considerable potential and flexibility for the evaluation of load-haul-dump mining systems; (3) the user guide provides a valuable manual for the potential user of load-haul-dump mining systems and permits the implementation of the load-haul-dump simulator.

15259 **(FE—1231-27) Design optimization in underground coal systems. Volume IX. Modified FACESIM and COST-SCHED programs. Final technical report.** (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mining and Minerals Engineering). 28 Feb 1981. Contract AC01-76ET10722. 198p. NTIS, PC A09/MF A01.

The objective of this research was to modify the FACESIM and COST-SCHED computer programs in order to remove the limitations that were originally placed on the programs, make improvements considering recent advances in computer technology, and to increase versatility of these programs. The modified FACESIM and COST-SCHED computer programs now include the following options: (1) a routine which simplifies the input data cards required by the original FACESIM program; (2) provisions to plot graphically the output of FACESIM program; (3) an integrated computer program, which includes the original and two later versions as options of the FACESIM suite of programs - the Two Roofbolters and the Battery Haulage versions; and (4) an expansion of the COST-SCHED program (SCHED 3, which is a sub-routine) to compute ash, BTU, sulfur and reject values as the coal is mined. The modified FACESIM and COST-SCHED programs may be used in a variety of applications including evaluation of mining conditions and methods, designing section layouts, evaluating and designing new equipment, justifying capital expenditures, developing and maintaining production schedules and quality control standards. The computer programs and their predecessors have been used successfully in simulating mining activities over an extended period of time in a variety of mining conditions in this nation and other nations of the world. The face operations in coal mining include many variables related to coal cutting, loading and transportation activities, the characteristics of various equipment used in performing these activities, and the mine section layout. The interrelated effect of these many variables on the efficiency of face operations may be investigated effectively by the developed computer programs.

15260 **Roads in mines.** Rao, C.S.R. *Indian Mining and Engineering Journal ;* **19**: No. 10, 5-9(Oct 1980).

Haulage of ore and waste constitute about 70% of the extraction costs and about 30% of the pit head cost. For the same hauling distance, performance of the haulage fleet is a variable dependent upon the road conditions. While operating costs of other extraction units remain more or less fixed haulage cost varies. Proper planning, construction and upkeep and maintenance of roads is essential to effect economies in haulage costs.

15261 **Automated guidance and control of longwall mining machines.** Palowitch, E.R. (Dept. of Energy, Pittsburgh, PA); Broussard, P.H. Jr. *Journal of Energy ;* **3**: No. 6, 329-334(Nov 1979).

From 15. AIAA annual meeting and technical display; Washington, DC, USA (6 Feb 1979).

The longwall system of mining coal offers the potential for increasing unit production, worker productivity, and resource recovery with enhanced health and safety for the underground coal miner. At present, two operators must accompany longwall cutting-loading machines and manually raise and lower the cutting drums to maintain the desired cutting profiles. By automating this system, the hands-on operators could be replaced by a machine overseer and both the quality and the quantity of coal produced could be increased significantly. This paper describes the progress of a pioneering effort to develop pitch, roll, and yaw control subsystems to fully automate the longwall mining of coal. Results to date are encouraging and indicate that an automated system can reduce errors in cutting coal under manual control by two-thirds and can significantly increase coal production, particularly in thin coalbeds.

15262 **Surface coal mining and reclamation symposium (Coal conference and Expo V).** New York, NY; McGraw-Hill, Inc. (1979). 326p. (CONF-7910117—).

From Coal conference and EXPO V; Louisville, KY, USA (23 Oct 1979).

The symposium on surface coal mining and reclamation coal conference and expo V was held October 23 to 25, 1979, at the Kentucky Fair and Exposition Center, Louisville, Kentucky. Thirty-two papers from the proceedings have been entered individually into EDB and ERA. (ITN)

15263 **Development of a working relationship with your OSM inspector.** Short, D.C. (Office of Surface Mining, Knoxville, TN). pp 3-4 of Surface coal mining and reclamation symposium (Coal conference and Expo V). New York, NY; McGraw-Hill, Inc. (1979).

From Coal conference and EXPO V; Louisville, KY, USA (23 Oct 1979).

The Federal Act is very specific on a great many points regarding what inspectors must consider whenever they go on a mining site. Our inspectors have very little leeway in the performance standards they require. One of those is the requirement to completely cover the highwall in steep-slope mining. That requirement is written into the law. Our inspectors have had no choice but to enforce it. There are many other such requirements. The only point I am making is that our inspectors are required to enforce the law as written. It seems clear to me that neither the Office of Surface Mining nor the Federal Surface Mining Control Act will go away. Congress may, of course, change the law. Perhaps changes are in order. If that should happen, our inspectors will enforce whatever changes are made to the best of their ability. But I am confident that OSM is here to stay, just as I have every confidence the coal industry is here to stay. Our inspectors are required by law to document any violation of the Surface Mining Act they find. But they are not telling you how to mine coal. At most, the Notices of Violation or Cessation they write reflect their conviction that your reclamation efforts are not sufficient to meet the performance standards set forth in the law. I would encourage all coal mine operators and superintendents to seek out our OSM inspectors instead of hiding from them or ignoring them. If you think you might have a problem, consult with them - see if they can not offer advice as to solving that problem without violating the Federal Act. It may not be necessary in all cases for an inspector to come to your operation to help you solve a potential problem. Perhaps you can call him on the telephone, or drop by his office for a chat, to get some advice. Although the workload on our inspectors is very heavy, they are willing to talk to you at any time. We have engineers in our district offices to give such advice also.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 15742

15264 **(DOE/ER/10466—T2) Efficient ultrasonic grinding: a new technology for micron-sized coal. Quarterly technical progress report No. 3, March 16, 1980-June 15, 1980.** Tarpley, W.B. Jr.; Howard, P.L.; Moulder, G.R. (Energy and Minerals Research Co., Exton, PA (USA)). 1 Jul 1980. Contract AC02-79ER10466. 18p. NTIS, PC A02/MF A01.

During the third quarter, work focused on design and development of the dual roller comminution apparatus, based on operation and evaluation of the cylinder segment test apparatus. Tests of the dual roller will be conducted during the next quarter. Determinations of the degree of preferential liberation of pyrite and ash inclusions were conducted with results that clearly demonstrate this ultrasonic effect. In preliminary tests, 67% of the pyrite and at least 21% of the ash inclusions were liberated and were amenable to settling collection in the -10 micron size range. Larger scale testing is being conducted to expand the data base and better quantify the degree of preferential liberation.

15265 **(DOE/ER/10466—T3) Efficient ultrasonic grinding: a new technology for micron-sized coal. Quarterly technical progress report No. 2, December 16, 1979-March 15, 1980.** Tarpley, W.B. Jr.; Howard, P.L.; Moulder, G.R. (Energy and Minerals Research Co., Exton, PA (USA)). 3 Apr 1980. Contract AC02-79ER10466. 22p. NTIS, PC A02/MF A01.

Work focused on establishing experimentally determined parameters for ultrasonic comminution and their translation into the design of an ultrasonic comminution array for Phase I testing. Early work indicated that continuous removal of fines during communition could significantly increase the production of -10 micron particles. Similarly, varying the mechanical gain of the ultrasonic comminution apparatus and thereby increasing the strain amplitude of the system was shown to enhance fines production. A gain of 3:1 (i.e., a three-fold increase in strain amplitude) produced the best results. These features used with an ultrasonic cylinder segment apparatus resulted in 276% increase in the production of -10 micron fines over that generated by passing coal through a non-activated control. Thus influenced, the design of the Phase I ultrasonic comminution apparatus will incorporate both a dual-roll and roller/plate capability; it will provide continuous flow of particles through the region of ultrasonic activation, thus permitting removal of fines as they are comminuted; and will function with a gain of 3:1. The Phase I apparatus also offers the flexibility of operating with either traveling or standing ultrasonic waves. Varying the physical configuration (dual-roller or roller plate) and the mode of ultrasonic activation (traveling or standing wave) allows for cost effective testing of four different techniques. Additionally, operating frequency has been reduced to 15 kHz to permit use of off-the-shelf hardware in apparatus assembly and thus expedite testing. Selection of four representative, well-characterized coals has been completed; after initial testing, 200 lb. quantities of two of the samples will be secured for Phase II experimentation.

15266 **(DOE/ER/10466—T4) Efficient ultrasonic grinding: a new technology for micron-sized coal. Quarterly technical progress report No. 1, September 15-December 15, 1979.** Tarpley, W.B. Jr.; Howard, P.L.; Moulder, G.R. (Energy and Minerals Research Co., Exton, PA (USA)). 9 Jan 1980. Contract AC02-79ER10466. 19p. NTIS, PC A02/MF A01.

During the first quarter, preliminary testing demonstrated the ability of ultrasonically enhanced comminution to increase fraction of -200 mesh particles by 100 to 500% over mechanical grinding alone. Modification of the preliminary ultrasonic comminution process to include cycles of ultrasonic activation followed by removal of fines has shown a significant increase in the production of -325 mesh particles (-44 microns) with substantial fractions in the -20 micron and -10 micron ranges. Efforts to characterize coal samples have yielded a correlation between Hardgrove Grindability Index (HGI) and susceptibility to ultrasonic comminution. This information, along with other considerations and data relating to the cost effectiveness of industrial ultrasonic comminution, will be used to select coal samples for the Phase II experiments. While several preliminary equipment configurations have been used, their purpose has been mainly to verify the mechanism of ultrasonic comminution and to secure information for the design and fabrication of optimized laboratory apparatus for Phase II testing. On this basis a nip configuration has been selected to insure contact throughout the ultrasonic activation period and prevent coal particle compaction.

15267 **(DOE/PC/20139—T1) Heavy-liquid beneficiation of fine coal. First quarterly report, September 18, 1980-December 31, 1980.** Keller, D.V. Jr.; Simmons, F.J. (Otisca Industries, Ltd., Syracuse, NY (USA)). 1980. Contract AC22-80PC20139. 42p. NTIS, PC A03/MF A01.

The Heavy Liquid Beneficiation of Fine Coal is a fundamental research program directed towards developing a basic understanding of the rheology of fine coal-heavy liquid slurries, and the application of this understanding to the development of a pilot test facility. The tasks scheduled and accomplished in the first quarter were: the selection and characterization of the coal to be used; the design, construction and testing of a dynamic viscosity cell for solid-liquid slurry systems; the selection and evaluation of candidate organic liquids and the determination whether or not one candidate liquid can be taken as representative of the class of liquids; and the ongoing evaluation of the three-dimensional slurry viscosity matrix as generated by coal size fraction, coal density fraction and slurry volume percent solid. The Canterbury Coal is acceptable for the slurry evaluation phase of this program. Freon-113 can be taken as representative of this class of organic liquid and used in the three-dimensional slurry matrix evaluation. The choice of Freon-113 over Freon-11 is a matter of experimental convenience based on the higher boiling point of Freon-113. The dynamic flow viscosity cell as currently designed is capable of generating accurate viscosity data.

15268 **(EPRI-CS—1705) Otisca Process: a pilot plant study of dense liquid separation.** Keller, D.V. Jr.; Rainis, A. (Otisca Industries, Ltd., Syracuse, NY (USA)). Feb 1981. 80p. NTIS, PC A05/MF A01.

The Otisca Process for cleaning coal is based on gravity separation of the feed in a dense medium separator. The parting liquid

is a fluorocarbon of low boiling point, low latent heat of vaporization and high density (1.5 g/cm^3). The parting liquid is recovered from the product coal and reject and recycled to the process. Due to the low latent heat of vaporization of the fluorocarbon, (77.5 Btu/lb at 77°F) in comparison to water (971 Btu/lb at 212°F) the energy required for the operation of the evaporators is much reduced. No pre-screening of the feed is necessary and the very low viscosity of the fluorocarbon parting liquid results in much shorter separation times than are observed with magnetite suspensions. The distribution curves for the Otisca Process based on an eight-hour test run at Otisca's pilot plant located in Florence, Pennsylvania is reported. The feed was 3/8" x 1.4", 1/4" x 28m, 28m x 100m and 100m x 325m size fractions from a full washability study of the feed, product and reject collected during steady state operation. Probable errors, Epm, error areas and organic efficiencies were calculated from the data. For a 3/8" x 325m feed, the probable error was 0.023 at a 1.49 sp gr of separation. The corresponding organic efficiency was 98%. Based on sharpness-of-separation criteria, the Otisca Process is superior to others utilizing heavy media cyclones, hydrocyclones and concentrating tables. Further testing is recommended to determine the effect of operating conditions such as feed rate, size consist and moisture content on separation efficiency so that a more extensive data base is available for design purposes. No attempt was made to evaluate freon losses or process economics.

0140 Combustion

REFER ALSO TO CITATION(S) 15620, 15621, 15753, 15757, 15770, 15912, 15976

15269 (DOE/ER/10029—T1) Coal combustion aerothermochemistry research. Final report. Witte, A.B.; Gat, N.; Denison, M.R.; Cohen, L.M. (TRW Defense and Space Systems Group, Redondo Beach, CA (USA). Energy Technology Dept.). 15 Dec 1980. Contract AC01-79ER10029. 260p. NTIS, PC A12/MF A01.

On the basis of extensive aerothermochemistry analyses, laboratory investigations, and combustor tests, significant headway has been made toward improving the understanding of combustion phenomena and scaling of high swirl pulverized coal combustors. A special attempt has been made to address the gap between scientific data available on combustion and hardware design and scaling needs. Both experimental and theoretical investigations were conducted to improve the predictive capability of combustor scaling laws. The scaling laws derived apply to volume and wall burning of pulverized coal in a slagging high-swirl combustor. They incorporate the findings of this investigation as follows: laser pyrolysis of coal at 10^6 K/sec and 2500K; effect of coal particle shape on aerodynamic drag and combustion; effect of swirl on heat transfer; coal burnout and slag capture for 20 MW/sub T/ combustor tests for fine and coarse coals; burning particle trajectories and slag capture; particle size and aerodynamic size; volatilization extent and burnout fraction; and preheat level. As a result of this work, the following has been gained: an increased understanding of basic burning mechanisms in high-swirl combustors and an improved model for predicting combustor performance which is intended to impact hardware design and scaling in the near term.

15270 (DOE/ET/10379—T4) Industrial application fluidized bed combustion: Category III. Indirect fired heaters. Quarterly technical report No. 16, April 1-June 30, 1980. (Exxon Research and Engineering Co., Florham Park, NJ (USA). Engineering Technology Dept.). 1980. Contract AC01-76ET10379. 39p. NTIS, PC A03/MF A01.

A program is underway to evaluate the technical and economic potential for the application of fluidized bed combustion to refinery and petrochemical plant indirect fired process heaters. The strategy of the program is to build on available boiler oriented FBC technology. Areas common to both steam generating boilers and process heaters will not be intentionally advanced by this program. However, the results of complimentary programs in the boiler area will be considered in the assessment of potential heater applications. Two areas which are being investigated here concern the effect of larger tube size and hydrocarbon coking. Phase I of the program consists of the design, construction and operation of three laboratory facilities to carry out these studies. A Process Stream Coking Test Unit has been used to study the parameters affecting coke laydown on the internal surfaces of hydrocarbon containing tubes under conditions of high temperature and heat transfer rate. The High Temperature Heat Flux Test Unit was put into operation. Tests using both propane and coal fuels have been completed. The object of the Economic and Applications Task of the Program is to evaluate the economic and logistic factors that might influence the schedule and circumstances under which coal fired Atmospheric Fluidized Bed Combustion (AFBC) technology might be applied to petroleum and petrochemical plant process heaters. The results of these studies indicate that the potential for near term application of AFBC technology to refinery crude heaters is relatively low. The final task will be to prepare a design specification for a hypothetical commercial sized process heater from which all interested parties can make a definitive evaluation of the technical and commercial prospects of the technology.

15271 (DOE/MC/08196—T1) Metallic species derived from fluidized bed coal combustion. Natusch, D.F.S.; Taylor, D.R. (Colorado State Univ., Fort Collins (USA). Dept. of Chemistry). 1980. Contract AS21-77MC08196. 110p. NTIS, PC A06/MF A01.

Samples of fly ash generated by the combustion of Montana Rosebud coal in an experimental 18 inch fluidized bed combustor were collected. The use of a heated cascade impactor permitted collection of size fractionated material that avoided condensation of volatile gases on the particles. Elemental concentration trends were determined as a function of size and temperature and the results compared to published reports for conventional power plants. The behavior of trace metals appears to be substantially different in the two systems due to lower operating temperatures and the addition of limestone to the fluidized bed. Corrosion of the impactor plates was observed at the highest temperature and lowest limestone feed rate sampled during the study. Data from the elemental concentration and leaching studies suggest that corrosion is most likely due to reactions involving sodium sulfate. However, it is concluded that corrosion is less of a potential problem in fluidized-bed systems than in conventional coal-fired systems.

15272 (EPRI-AP—1666) Catalytic combustion of coal-derived liquid fuels. Final report. Chu, E.K.; Snow, G.C.; Tong, H. (Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.). Jan 1981. 140p. NTIS, PC A07/MF A01.

Catalytic combustors are a promising means of achieving ultralow NO/sub x/ emissions from utility gas turbines operating on distillate or natural gas fuels. However, due to potential shortfalls in the availability of these fuels, the utility may be forced to temporarily burn an alternative fuel. Coal-derived liquids are candidate alternative fuels for utility gas turbines. The purpose of this research program funded by the Electric Power Research Institute was, therefore, to evaluate the feasibility of catalytically burning currently available coal-derived liquids. The objectives of this program were to determine the combustion characteristics of coal-derived liquids in catalytic reactors and to evaluate possible long-term poisoning of the catalyst by the coal-derived liquid. Tests were conducted with three state-of-the-art catalytic materials and three fuels: No. 2 diesel for baseline data, and H-Coal and SRC II coal-derived liquids. The results show that coal-derived liquids can be burned catalytically, but the catalysts were prone to poisoning or deactivation. However, the causes for catalyst deactivation were not clearly identified.

15273 (EPRI-CS—1688) Atmospheric fluidized-bed combustion development facility. Final report. Hoover, G.R.; Loudin, K.L.; Modrak, T.M.; Morris, T.A.; Pfeiffer, R.E. (Babcock and Wilcox Co., Alliance, OH (USA). Research and Development Div.). Jan 1981. 356p. NTIS, PC A16/MF A01.

The objectives of this project were to design, construct, and commission an atmospheric fluidized-bed combustion (AFBC) test facility capable of: producing performance data suitable for scale-up to utility-size units; evaluating changes to the process relative to improving performance or reducing cost; and providing data that could be used as a base for design correlations. A bed size of 6 feet x 6 feet was selected as being large enough to bridge the gap be-

tween bench-scale units and commercial units. This size enabled use of multiple coal feeds at state-of-the-art spacing. Sufficient instrumentation was installed for accurate measurement of parameters identified as required for performance data. These parameters included: coal and limestone feed rate, ash removal rate, forced-draft air flow, temperatures and pressures throughout the unit, gas composition at various locations, and others. The 6 x 6 AFBC was constructed with sufficient flexibility to allow future design changes. Selection of equipment (e.g., coal feeder, conveyors, etc.) was based partially on price and delivery, but mainly on reliability and the capability for long-term, continuous operation. The 6 x 6 will be the major AFBC test facility to develop performance data for the commercial development of AFBC. Specifically, it will aid in design correlation development, in the application of these correlations to utility conceptual design studies including economic assessments, and in forming the basis for scale-up for larger pilot and demonstration AFBC units.

15274 (PNL—3700(Pt.4), pp 1-7) **Reaction Kinetics of Combustion Products.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

The goal of the Reaction Kinetics of Combustion Products program is to determine the conditions, mechanisms, and chemical reactions that control the identity and concentrations of emissions from coal combustion processes. Presently, the major emphasis of the program is on the investigation of the mechanism of formation of organic pollutants during combustion. Mass spectrometric techniques have been developed for the study of the high-temperature kinetics relevant to coal combustion, with specific emphasis on techniques that will allow investigation of the mechanisms and rates of formation for toxic and carcinogenic organic compounds.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 15224, 15770

15275 **(DOE/FE—0012) Interim report of the interagency coal export task force: draft for public comment.** (USDOE Office of the Secretary, Washington, DC. Interagency Coal Export Task Force). Jan 1981. 124p. NTIS, PC A06/MF A01.

The Interagency Coal Export Task Force was formed in the Spring of 1980 at the direction of the President, in support of the international efforts of the United States, encouraging the use of coal. Its purpose was to report on possible courses of action to increase United States steam coal exports in a manner consistent with other national policies, including our commitment to environmental protection. The Task Force assembled existing data, developed significant new information regarding the international coal market and undertook analyses of apparent problems underlying coal exports. The Task Force contributed to a public awareness of the fact that increased coal exports will serve both the domestic and international interests of the United States. Based upon extensive, independent field studies in Europe and the Far East, the Task Force concludes that there will be significant growth in world demand for steam coal. Such growth has already begun, has contributed to the almost seven-fold increase in United States overseas steam coal exports for 1990 over 1979, and is expected to continue beyond the end of this century. The growth in world steam coal trade projected in the report does not guarantee United States coal exporters a large or expanding share of the market. The United States' role depends on the buying strategies of the consuming countries, the policies and prices of competing exporters, and the actions taken by the United States to maintain reasonable prices, prompt delivery and dependable quality. Projections of United States steam coal exports, therefore, rest upon a number of highly uncertain factors which are discussed in some detail.

0160 Health And Safety

REFER ALSO TO CITATION(S) 15245

15276 **(LMF—83) Fluidized-bed combustion emissions: toxicology program. Status report.** Hobbs, C.H.; Carpenter, R.L. (eds.). (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76EV01013. 43p. NTIS, PC A03/MF A01.

The purpose of this report is to summarize the information available as of July 1980. Special emphasis has been given to comparisons between the AFBC information available to date and information available from the conventional combustion of coal, even though these comparisons are between an experimental scale unit on one hand and full sized units on the other. Major findings and conclusions are summarized.

15277 (PNL—3700(Pt.1), pp 29) **Solvent refined coal biostudies.** Mahlum, D.D. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The objective of this program is to establish a broad biomedical data base for solvent refined coal (SRC) materials to: (1) identify possible health effects problems, (2) help identify appropriate control technologies or operating parameters to minimize potential health effects, and (3) help the SRC technology to meet present and future regulatory requirements. We are employing an approach which integrates chemical characterization, cellular and animal bioassay systems, and dosimetric studies.

15278 (PNL—3700(Pt.1), pp 30) **Perinatal effects of SRC.** Andrew, F.D. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The objective of this project is to establish an improved set of criteria for evaluating the potential of agents to induce one or more manifestations of developmental toxicity. A general approach is being developed that is applicable for testing physical, chemical, and nutritional hazards in appropriate animal models. This approach focuses on subtle functional impairments at various times during maturation, rather than on the more traditional emphasis on structural malformations. Adverse effects detected in this test system are analogous to those expressed in human neonates as stunted growth, congenital errors of metabolism, neurological or mental retardation, and immunodeficiencies.

15279 (PNL—3700(Pt.1), pp 31) **Mutagenicity of SRC materials.** Pelroy, R.A. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The mutagenic components in high-boiling SRC-II liquids have been analyzed by a combination of chemical and biochemical methods. Separation of compounds from these materials was carried out by solvent-solvent extraction and thin-layer chromatography. The location of genetically active compounds in the resulting fractions was identified by testing for mutagenesis, using the Ames/Salmonella test. Biochemical verification of primary aromatic amines (PAAs) in the same fractions was achieved by enzymatic means with a mixed-function amino oxidase (MFAO) specific for PAAs. The quantitative importance of the PAAs to the mutagenicity of the high-boiling liquids was implied by inactivation of most of the mutagenic activity in the SRC materials following treatment with nitrous acid. Hydrotreatment (catalytic reduction of hydrogen) of high-boiling SRC liquids resulted in a more than 99% decrease in their mutagenic activity.

0170 Legislation And Regulations

REFER ALSO TO CITATION(S) 15263

02 PETROLEUM

0202 Geology And Exploration

REFER ALSO TO CITATION(S) 15562

0203 Drilling And Production

REFER ALSO TO CITATION(S) 15497

15280 (DOE/BC/10027—12) Experimental evaluation of reservoir pretreatment in chemical flooding. Final report. Surkalo, H.; Pouska, G. (Exoil Services, Golden, CO (USA)). Feb 1981. Contract AC19-79BC10027. 53p. NTIS, PC A04/MF A01.

Fifty-six radial disk floods in Berea sandstone were completed to evaluate the effect of various reservoir pretreatment systems. The primary study parameters were as follows: preflush size from 0 to 1 PV; preflush chemicals, inorganic and organic; Berea clay condition; fired vs unfired; and connate water composition in the absence of preflush. From these disk floods the following effects were identified: in the absence of other contrary forces, increasing preflush size improves oil recovery. The effect is pronounced up to 0.5 PV. Above this level the improvement is minimal; clay alteration as produced by disk firing has a profound detrimental effect on tertiary oil recovery; most inorganic chemical preflushes were beneficial. A soft saline preflush is effective in displacing the divalent cations in the connate water. It also provides the opportunity for cation exchange with divalent cations on the Berea clays. Preflush chemicals which precipitate or sequester the calcium and magnesium generally provided additional benefit; organic preflushes were also effective especially the lignosulfonates which were used as sacrificial agents; a high monovalent/divalent cation ratio in connate brine generally was beneficial for oil recovery when no preflush was employed; a high frontal velocity leads to low oil recovery, presumably due to by-passing of considerable pore space; and the floods showed an inverse relationship between sulfonate retention and oil recovery. As increasing quantities of sulfonate were precipitated or otherwise lost from the slug, residual oil concentrations rose.

15281 (DOE/ET/12056—17) Further results determining permeability and thickness for a multi-layer five spot tracer test. Brown, S.L.; Brigham, W.E. (Stanford Univ., CA (USA). Petroleum Research Inst.). Feb 1981. Contract AC03-76ET12056. 32p. NTIS, PC A03/MF A01.

This report presents further results obtained using a computer algorithm developed by Dexter Yuen, which gives an indication of the heterogeneity among the layers of a reservoir. Yuen, Brigham and Cinco-Ley presented a match obtained by this program with field data reported by Brigham and Smith. To find a more accurate fit for these data, the program was modified to allow the selection of up to ten peaks. Results of this more detailed analysis are presented.

15282 (DOE/ET/12056—19) Determining the end of infinite-acting behavior for producing wells in closed rectangles. Report SUPRI TR-19. Gobran, B.D.; Abbaszadeh-Dehghani, M. (Stanford Univ., CA (USA). Petroleum Research Inst.). Feb 1981. 26p. NTIS, PC A03/MF A01.

During a pressure drawdown test, all wells behave as if they are in an infinite reservoir for a brief period (termed the infinite-acting time). In an attempt to better determine this time for well locations in closed rectangular shapes, we have produced computer and hand calculator programs as well as contour graphs that yield the dimensionless time (in terms of area), t/sub DA/, which defines the end of the infinite-acting period.

15283 (DOE/ET/12059—4) 200 Steamflood Demonstration Project. Fourth annual report, June 1979-June 1980. Alford, W.O. (Santa Fe Energy Co., Santa Fe Springs, CA (USA). Chanslor Div.). Feb 1981. Contract AC03-76ET12059. 49p. NTIS, PC A03/MF A01.

The 200 Sand Steamflood Demonstration Project is testing an enhanced steamflooding technique in the Midway-Sunset Field, Kern County, California. This project was initiated to demonstrate the operational, recovery, and economic aspects of steamflooding a typical heavy oil reservoir which had unfavorable response to cyclic steam stimulation. A pilot test was conducted in four (4) 2.35 acre inverted seven-spot steam drive patterns, which were not fully developed with producers. As a result of the response shown by the pilot, in April 1980, work began to expand the pilot area to a total of fourteen (14) fully developed 2.35 acre inverted seven-spot patterns. Expansion to a full-scale steamflood test will consist of drilling and completing 30 producing wells and 10 steam injection wells. The reservoir contains approximately 50 million barrels of oil-in-place in a structure that lies between 400 and 700 feet in depth.

15284 (DOE/ET/14033—1) Chemical flood progress evaluation test, South Pass Block 27 field, Plaquemines Parish, Louisiana. Final report, September 28, 1979-May 16, 1980. Johnston, J.R.; Guillory, A.J. (Shell Oil Co., New Orleans, LA (USA)). Feb 1981. 26p. NTIS, PC A03/MF A01.

A field test of a surfactant flooding process has been designed for a reservoir located in the South Pass Block 27 field, Plaquemines Parish, Louisiana. The objectives of the test are to continue chemical flooding research by applying the process in a reservoir which is a candidate for this enhanced oil recovery technique if the process is proved economically viable. The plan is to acquire field data which will lead to a better understanding of how the process works under reservoir conditions at a well-to-well distance intermediate to laboratory floods and economic well spacing. The initial step in starting the field test began late in 1979 when the first pilot injection-residual oil saturation determination well was drilled and pressured cored in the selected test reservoir, the N_4 sand Reservoir B, at about 8000 feet. A log-inject-log measurement in this well has also been completed to provide an added evaluation. This report documents the results of the N_4, sand residual oil saturation measurements in Well SL 1011 No. 88. The Shell-DOE contract is restricted to this phase of the field test. Results indicate a waters-wept residual oil saturation less than 20% at the objective location based on coring and PNC log-inject-log measurements. The value is lower than anticipated. Consequently, an alternate test site must be selected if the field test plans are continued.

15285 (DOE/ET/14317—T2(Vol.2)) Review of technology for Arctic offshore oil and gas recovery. Appendices. Sackinger, W.M. (Alaska Univ., Fairbanks (USA). Geophysical Inst.). 6 Jun 1980. Contract AC01-80ET14317. 943p. NTIS, PC A99/MF A01.

Portions of document are illegible.

This volume contains appendices of the following: US Geological Survey Arctic operating orders, 1979; Det Noske Vertas', rules for the design, construction and inspection of offshore technology, 1977; Alaska Oil and Gas Association, industry research projects, March 1980; Arctic Petroleum Operator's Association, industry research projects, January 1980; selected additional Arctic offshore bibliography on sea ice, icebreakers, Arctic seafloor conditions, ice-structures, frost heave and structure icing.

15286 (DOE/MC/05301—62) Rock Creek Carbon Dioxide Pilot Project. Annual report, July 1979-June 1980. King, P.E. (Pennzoil Co., Vienna, WV (USA)). Jan 1981. Contract AC21-76ET12002. 52p. NTIS, PC A04/MF A01.

The carbon dioxide injection aspect of the project proceeded smoothly except during supply shortages. An actual effective injection of only 31% rather than the estimated 50% has reduced the percent pore volume of carbon dioxide injected into the pattern area to well below the design volume. Therefore, additional carbon dioxide injection may be required to insure a fair evaluation of this displacement mechanism. To date, this pilot has given no evidence to indicate that a miscible carbon dioxide flood will fail to economically recover a significant amount of oil, provided a sufficient volume of carbon dioxide is injected.

15287 **(SAND—80-2873) Project DEEP STEAM quarterly report, July 1-September 30, 1980.** Johnson, D.R.; Fox, R.L.; Clay, R.G.; Donaldson, A.B.; Eisenhawer, S.W.; Lyle, W.D.; Mulac, A.J. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 38p. NTIS, PC A03/MF A01.

The objective of Project DEEP STEAM is to develop the technology required to economically produce heavy oil from deep reservoirs. The tasks included in this project are development of thermally efficient delivery systems and downhole steam generation systems. A demonstration running test of a multi-string downhole generator was conducted this quarter. Tests and evaluation of various configurations of downhole generator systems were performed in preparation for the next field test. The site for the Phase II field test operation was identified as the Wilmington Field in the Los Angeles Basin; the test will be conducted in cooperation with the City of Long Beach.

0204 Processing

15288 **Investigating the performance of meter provers.** Reed, B.; Jespersen, K.L.; Spencer, E.A. (Natl Eng Lab, East Kilbride, Glasgow, Scotl). *Institute of Petroleum, [Technical Paper] IP ;* No. 79-001, vp(1979).

Meter provers have been used as calibration standards in the petroleum industry for many years. The reliability of the meter prover is well known but it is often taken for granted. The claims made for the repeatability and accuracy of the meter prover are often very high, but at the present time very little experimental evidence has been published to substantiate these claims. The main objectives of the program have been (a) to examine how various factors can affect the performance of meter provers and (b) to supply the missing data to enable designers to optimize the size and performance of meter provers. It is considered that through this work development towards more cost-effective use of meter prover installations is possible. Research results are presented and proposals for further work in this project are outlined. 4 refs.

0205 Products And By-products

REFER ALSO TO CITATION(S) 15270

0206 Health And Safety

REFER ALSO TO CITATION(S) 16124

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 15735

15289 **(AD-A—084153) Eastern Europe and oil: the Soviet dilemma.** Burger, E.S. (RAND Corp., Santa Monica, CA (USA)). Oct 1979. 47p. NTIS, PC A03/MF A01.

The nations of Eastern Europe depend on Soviet oil because it is less expensive than that bought at world prices, it can be obtained without draining scarce hard-currency reserves, and it is reliably supplied. Since 1970, however, the Soviet Union has been urging its CMEA/Warsaw Pact allies to seek additional suppliers. The Central Intelligence Agency predicts that Soviet oil production will level off in the near future and then decline. Lower production and increased domestic consumption, the CIA suggests, will cause the Soviets to cut their oil exports to the West and hold at a constant level their oil exports to Eastern Europe. This paper postulates that as long as industrial growth in Eastern Europe continues, the demand for oil will increase. The non-Soviet CMEA nations cannot now afford to buy large amounts of oil from OPEC. For this reason, the Soviet Union will probably continue to increase its oil sales to the CMEA nations, rather than risk their economic deterioration, which might lead to political unrestand instability.

15290 **(DOE/EIA—0268(77)) Selected characteristics of the US oil and gas producing industry: a 1977 reserves report supplement.** Burke, D.J. (Department of Energy, Washington, DC (USA). Energy Information Administration). Feb 1981. 82p. NTIS, PC A05/MF A01.

This is the first of a series of reports prepared as an exploratory by-product of the analysis of detailed oil and gas reserve and production data collected on the Energy Information Administration's (EIA) Form EIA-23, Annual Survey of Domestic Oil and Gas Reserves. The principal product of the analysis is published as an annual report containing estimates of proved oil and gas reserves by State and selected State subdivisions. This report supplements the 1977 EIA annual reserves report by presenting data which either were not included in the reserves report, or were included in a more aggregated form. There is a general theme throughout the report centering on reserves ownership and operation, however, not all facets of this initial report are equally developed. It is intended that this report stimulate a dialogue with those interested in elements of the data presented, for use in the appropriate development of subsequent reports.

15291 **(DOE/RA—0011(80)) Annual report of operations.** (USDOE Assistant Secretary for Resource Applications, Washington, DC. Office of Naval Petroleum and Oil Shale Reserves). 1980. 61p. NTIS, PC A04/MF A01.

The Naval Petroleum and Oil Shale Reserves during FY 1980 deliver 59,993,213 bbl of crude oil and substantial quantities of natural gas, butane, propane and natural gasoline to the United States market. During September, Naval Petroleum Reserve oil was utilized to resume filling the Strategic Petroleum Reserve. During FY 1980, Naval Petroleum Reserve No. 1, Elk Hills, became the largest producing oil field in California and the second largest producing field in the United States. Production at the end of September was 165,000 bbl/d; production is expected to peak at about 190,000 bbl/d early in calender year 1982. Production from Naval Petroleum Reserves Nos. 2 and 3 in California and Wyoming, contributed 1,101,582 and 1,603,477 bbl of crude oil to the market, respectively. Enhanced oil recovery work has been inititated at Naval Petroleum Reserve no. 3. Total revenues from the Naval Petroleum Reserves during FY 1980 were 1.6 billion. The three Naval Oil Shale Reserves in Colorado and Utah have substantial potential. In addition to containing approximately 2.5 billion bbl recoverable shale oil. They probably contain significant quantities of conventional oil and gas.

15292 **(ER—80-10493) Some perspectives on oil availability for the non-OPEC LDCs.** (National Foreign Assessment Center (CIA), Washington, DC (USA)). Sep 1980. 60p. Dep. NTIS (US Sales Only).

This report presents data and insights on the petroleum supply problems of the non-OPEC less developed countries (LDCs). The core of the material is a set of tables on oil production, trade, and consumption for 58 countries, which together account for more than 90% of non-OPEC LDC totals in these categories. In sum, since 1973 poorer countries have been struggling to deal with a serious disruption to the global economy and their own development prospects. Most have stumbled forward only because developed country growth, expanded exports, and private commercial borrowing have enabled them to offset a bloated oil bill. As a group, the non-oil-exporting LDCs are generally strong enough to sustain most of their growth momentum in 1980, but the outlook thereafter is not bright. Rising debt service burdens, dwindling foreign exchange, and slowed growth in export markets will restrain LDC abilities to import. Thus, they must substantially lower their nonfuel imports and accept slow development if they are to cover their enlarged oil bills.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 15297, 16114, 16123, 16126

15293 (AD-A—084240) Break up of oil on rough seas - simplified models and step-by-step calculations. Final report. Aravamudan, K.; Raj, P.K.; Newman, E.; Tucker, W.A. (Little (Arthur D.), Inc., Cambridge, MA (USA)). Oct 1979. Contract DOT-CG-843466-A. 210p. NTIS, PC A10/MF A01.

This study tries to integrate the existing theoretical and experimental information regarding behavior of oil spills in ocean into a unified, sequential calculation procedure. Major consideration was given to developing the least sophisticated calculation procedures which maintain a reasonable description of the totality of the physical processes. The principal phenomena included in the prediction of spill behavior are: combined spreading and evaporation; the interaction of waves with the slick and formation of oil droplets; dispersion of droplets in the water column; and finally the formation and dispersion of slicklets due to turbulence in the ocean. The model has been exercised for four different types of oils: light crude, heavy crude, fuel oil no. 2 and fuel oil no. 6.

15294 (PB—80-209539) Proceedings of marine environmental implications of offshore drilling in the eastern Gulf of Mexico. Conference/workshops held at St. Petersburg, Florida on January 31, February 1, 2, 1974. Final report. Mar 1974. Contract DI-08550-CT4-5. 423p. NTIS, PC A18/MF A01.

The impending Outer Continental Shelf (OCS) oil exploration and production activities in the eastern Gulf of Mexico have catalyzed the interest and concern of a significant cross section of individuals and organizations. The conference/workshops were planned and held to properly define by priority the critical research and/or information needs in the subject area, to discuss the development of a scientifically sound and relevant interdisciplinary program and to identify the persons to implement same. The conference/workshop sessions were attended by 352 persons; participants came from many parts of the United States.

0210 Legislation And Regulation

15295 (DOE/RA/35012—1(Vol.1)) Analysis of the permitting processes associated with exploration of Federal OCS leases. Final report. (Faucett (Jack) Associates, Inc., Chevy Chase, MD (USA)). Nov 1980. Contract AC01-80RA35012. 191p. NTIS, PC A09/MF A01.

Under contract to the Office of Leasing Policy Development (LPDO), Jack Faucett Associates is currently undertaking the description and analysis of the Outer Continental Shelf (OCS) regulatory process to determine the nature of time delays that affect OCS production of oil and gas. This report represents the results of the first phase of research under this contract, the description and analysis of regulatory activity associated with exploration activities on the Federal OCS. Volume 1 contains the following three sections: (1) study results; (2) Federal regulatory activities during exploration of Federal OCS leases which involved the US Geological Survey, Environmental Protection Agency, US Coast Guard, Corps of Engineers, and National Ocean and Atmospheric Administration; and (3) state regulatory activities during exploration of Federal OCS leases of Alaska, California, Louisiana, Massachusetts, New Jersey, North Carolina, and Texas. Volume II contains appendices of US Geological Survey, Environmental Protection Agency, Coast Guard, Corps of Engineers, the Coastal Zone Management Act, and Alaska. The major causes of delay in the regulatory process governing exploration was summarized in four broad categories: (1) the long and tedious process associated with the Environmental Protection Agency's implementation of the National Pollutant Discharge Elimination System Permit; (2) the lack of mandated time periods for the completion of individual activities in the permitting process; (3) the lack of overall coordination of OCS exploratory regulation; and (4) the inexperience of states, the Federal government and industry relating to the appropriate level of regulation for first-time lease sale areas.

15296 (DOE/RA/35012—1(Vol.2)) Analysis of the permitting processes associated with exploration of Federal OCS leases. Final report. Volume II. Appendices. (Faucett (Jack) Associates, Inc., Chevy Chase, MD (USA)). Nov 1980. Contract AC01-80RA35012. 277p. NTIS, PC A13/MF A01.

Under contract to the Office of Leasing Policy Development (LPDO), Jack Faucett Associates is currently undertaking the description and analysis of the Outer Continental Shelf (OCS) regulatory process to determine the nature of time delays that affect OCS production of oil and gas. This report represents the results of the first phase of research under this contract, the description and analysis of regulatory activity associated with exploration activities on the Federal OCS. Volume 1 contains the following three sections: (1) study results; (2) Federal regulatory activities during exploration of Federal OCS leases which involved the US Geological Survey, Environmental Protection Agency, US Coast Guard, Corps of Engineers, and National Ocean and Atmospheric Administration; and (3) state regulatory activities during exploration of Federal OCS leases of Alaska, California, Louisiana, Massachusetts, New Jersey, North Carolina and Texas. Volume II contains appendices of US Geological Survey, Environmental Protection Agency, Coast Guard, Corps of Engineers, the Coastal Zone Management Act, and Alaska. The major causes of delay in the regulatory process governing exploration was summarized in four broad categories: (1) the long and tedious process associated with the Environmental Protection Agency's implementation of the National Pollutant Discharge Elimination System Permit; (2) thelack of mandated time periods for the completion of individual activities in the permitting process; (3) the lack of overall coordination of OCS exploratory regulation; and (4) the inexperience of states, the Federal government and industry relating to the appropriate level of regulation for first-time lease sale areas.

0240 Storage

REFER ALSO TO CITATION(S) 15741

15297 (DOE/PO/10114—2) Evaluation of brine disposal from the Bryan Mound site of the strategic petroleum reserve program. Final report. Case, R.J.; Chittenden, M.E. Jr.; Harper, D.E. Jr.; Kelly, F.J. Jr.; Loeblich, L.A.; McKinney, L.D.; Minello, T.J.; Park, E.T.; Randall, R.E.; Slowey, J.F. (Texas A and M Univ., College Station (USA)). Jan 1981. Contract FC96-79P010114. 496p. NTIS, PC A21/MF A01.

On March 10, 1980, the Department of Energy's Strategic Petroleum Reserve Program began leaching the Bryan Mound salt dome and discharging the resulting brine into the coastal waters off Freeport, Texas. During the months of March and April, a team of scientists and engineers from Texas A & M University conducted an intensive environmental study of the area surrounding the diffuser site. A pipeline has been laid from the Bryan Mound site to a location 12.5 statute miles (20 km) offshore. The last 3060 ft (933 m) of this pipeline is a 52-port diffuser through which brine can be discharged at a maximum rate of 680,000 barrels per day. Initially, 16 ports were open which permitted a maximum discharge rate of 350,000 barrels per day and a continuous brine discharge was achieved on March 13, 1980. The purpose of this report is to describe the findings of the project team during the intensive postdisposal study period of March and April, 1980. The major areas of investigation are physical oceanography, analysis of the discharge plume, water and sediment quality, nekton, benthos, phytoplankton, zooplankton, and data management.

15298 (SAND—80-2482) Results of borehole gravity surveys in two SPR wells. Beasley, R.R. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 208p. NTIS, PC A10/MF A01.

The utility of the borehole gravity survey as a tool to define the edge of a salt dome and to describe high-density and low-density materials within the salt dome is discussed. A logging program was conducted in two SPR wells to collect the data from which conclusions and recommendations are drawn. There was no indication of major high-density anomalies or major dome overhangs. A zone of porous salt is present in Well 111A. Expansion of the geophysical logging program is recommended, but regular use of borehole gravity is not recommended.

15299 **(SAND—80-2784) Leaching and oil fill schedules for the strategic petroleum reserve (SPR).** Shefelbine, H.C. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 84p. NTIS, PC A05/MF A01.

This report discusses the leaching and oil fill schedules of caverns being developed for the Strategic Petroleum Reserve program. In particular, detailed schedules for the Phase II development at Bryan Mound and West Hackberry are presented. The techniques used to develop these schedules from the computer-based simulations of the leaching process are discussed. Finally, methods for leaching the caverns in ways that maintain the maximum flexibility as to the amount of oil required are presented.

0250 Combustion

REFER ALSO TO CITATION(S) 15782

15300 **(AD-A—088008) Army experience and requirements for stability and cleanliness of diesel fuels. Interim report.** Stavinoha, L.L.; Westbrook, S.R.; LePera, M.E. (Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.). Jul 1980. Contract DAAK70-80-C-0001. 42p. NTIS, PC A03/MF A01.

The report reviews the general topic of fuel deterioration. Primary emphasis is on diesel fuels used in compression ignition engines, which power the majority of Army tactical and combat vehicles. Field problems regarding fuel stability and related problems are summarized, and the statuses of on-going RandD programs are outlined. This information places in perspective the background which has prompted current research activities to detect, predict, and prevent fuel stability-associated equipment failures. Concern for anticipating deleterious product formation in current and future fuel formulations composed of diverse petroleum crude and synthetic (shale or coal) crude oils, fuel/equipment interactions, diverse storage conditions, and the increased desire for prolonged storage periods provide the driving factors in defining the Army's fuel stability research programs. While placing these concerns in perspective, the Army's present and future needs for diesel fuel stability and cleanliness control are identified.

15301 **(PB—80-178213) Combustion of drops and sprays of No. 2 diesel oil and its emulsions with water and methanol. Volume I (experimental). Final report Jul 78-Aug 79.** Gollahalli, S.R.; Rasmussen, M.L.; Moussavi, S.J. (Office of the Publication Board, Washington, DC (USA)). Jan 1980. 231p. NTIS, PC A11/MF A01.

This report deals with an investigation directed to understand the combustion behavior of No. 2 diesel oil and its emulsions with water and methanol. This Volume (I) of the report presents the experimental results of the study, whereas Volume II describes the theoretical analysis. The experiments are carried out in three parts: (a) a study of stability and microstructure of emulsions, (b) single drop combustion studies, and (c) spray combustion studies. In the first part, the effects of internal phase concentration, the surfactant concentration, and the time of blending on the stability and microstructure of emulsions are examined. In the second part the effects of emulsion characteristics (internal phase concentration, surfactant concentration, and type of internal phase) and ambient variables (chamber temperature, chamber pressure, chamber oxygen concentration, and preheat temperature of emulsions) on the combustion behavior of unsupported single-isolated drops are studied. In the third part the effects of all the variables examined in part b on the combustion behavior and pollutant emission of sprays are studied. The results show that unsupported drops of No. 2 diesel oil emulsions with water and methanol undergo disruption during combustion and the fragmentation activity depends on emulsion and ambient variables. The ignition and pollutant emission characteristics of No. 2 diesel-oil sprays also are seen to be affected by emulsification.

15302 **(PB—80-178221) Combustion of drops and sprays of No. 2 diesel oil and its emulsions with water and methanol. Volume II (theoretical). Final report Jul 78-Aug 79.** Rasmussen, M.L.; Gollahalli, S.R. (Office of the Publication Board, Washington, DC (USA)). Jan 1980. 131p. NTIS, PC A07/MF A01.

This report deals with an investigation directed to understand the combustion behavior of No. 2 diesel oil and its emulsions with water and methanol. This Volume (II) of the report presents the theoretical analysis, whereas Volume I describes the experimental studies. Two theoretical models to analyze the variation of drop temperature with emulsion parameters have been developed. The differential model considers the diffusion and specific heat effects inside the composite emulsion drop. The integral model does not consider the temperature variation inside the drop. Analytic solutions for both models have been developed assuming constant properties. The integral model has also been solved numerically considering the variation of properties and using some empirical input data. Both models predict the variation of drop disruption time with the internal phase content in qualitative agreement with the experimentally measured values for the drops of No. 2 diesel oil-water emulsion with water volume fractions up to 0.20.

03 NATURAL GAS

0301 Reserves

REFER ALSO TO CITATION(S) 15253

15303 **(DOE/TIC—11417) Unconventional gas sources. Executive summary.** (National Petroleum Council, Washington, DC (USA)). Dec 1980. 50p. NTIS, PC A03/MF A01.

The long lead time required for conversion from oil or gas to coal and for development of a synthetic fuel industry dictates that oil and gas must continue to supply the United States with the majority of its energy requirements over the near term. In the interim period, the nation must seek a resource that can be developed quickly, incrementally, and with as few environmental concerns as possible. One option which could potentially fit these requirements is to explore for, drill, and produce unconventional gas: Devonian Shale gas, coal seam gas, gas dissolved in geopressured brines, and gas from tight reservoirs. This report addresses the significance of these sources and the economic and technical conditions under which they could be developed.

0302 Geology And Exploration

15304 **(METC/EGSP—817) Stratigraphic cross sections showing the Sunbury, Ellsworth, and Antrim shales (Devonian and Mississippian) in northern Indiana.** Hasenmueller, N.R.; Bassett, J.L. (Indiana Geological Survey, Bloomington (USA)). 1980. Contract AC21-76MC05204. 8p. NTIS, PC A02/MF A01.

15305 **(METC/EGSP—900) East-West cross sections, north and south of Rough Creek fault system.** Schwalb, H.; Norris, R. (Kentucky Geological Survey, Lexington (USA)). 1980. Contract AS21-78MC08215. 28p. NTIS, PC A03/MF A01.

15306 **(METC/EGSP—901) North-South cross section, west side of area.** Schwalb, H.; Norris, R. (Kentucky Geological Survey, Lexington (USA)). 1980. Contract AS21-78MC08215. 20p. NTIS, PC A02/MF A01.

15307 **(METC/EGSP—902) Isopach map of blocher, member of New Albany shale, Western Kentucky.** Schwalb, H.; Norris, R. (Kentucky Geological Survey, Lexington (USA)). 1980. Contract AS21-78MC08215. 16p. NTIS, PC A02/MF A01.

15308 **(METC/EGSP—903) Isopach map of Sweetland Creek, member of New Albany shale, Western Kentucky.** Schwalb, H.; Norris, R. (Kentucky Geological Survey, Lexington (USA)). 1980. Contract AS21-78MC08215. 16p. NTIS, PC A02/MF A01.

15309 **(METC/EGSP—904) North-South cross section, east side of area.** Schwalb, H.; Norris, R. (Kentucky Geological Survey, Lexington (USA)). 1980. Contract AS21-78MC08215. 9p. NTIS, PC A02/MF A01.

15310 **(METC/EGSP—905) Isopach map of Grassy Creek, member of New Albany shale, Western Kentucky.** Schwalb, H.; Norris, R. (Kentucky Geological Survey, Lexington (USA)). 1980. Contract AS21-78MC08215. 16p. NTIS, PC A02/MF A01.

15311 **(METC/EGSP—906) Occurrence of natural gas in the New Albany shale, Western Kentucky.** Schwalb, H.; Norris, R. (Kentucky Geological Survey, Lexington (USA)). 1980. Contract AS21-78MC08215. 16p. NTIS, PC A02/MF A01.

15312 **(METC/EGSP—907) Structure map of the base of the New Albany shale, Western Kentucky.** Schwalb, H.; Norris, R. (Kentucky Geological Survey, Lexington (USA)). 1980. Contract AS21-78MC08215. 16p. NTIS, PC A02/MF A01.

15313 **Influence of shale conductivities on electric conductivity of low permeability rocks.** Volk, L.J.; Carroll, H.B. pp 69-76 of SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

The correlations among the physical properties of core plugs taken from the Mesaverde formation in the Uinta basin (Utah) were examined. Porosity, permeability, surface area and cation-exchange capacity were determined. The effects of the KCl-based drilling mud on electric logs were of particular concern because of the relatively high invasion profile. There is some evidence that the particular counterion may need to be considered. Although few samples were available and variability was limited, the Waxman-Smits model or the dual-water model of Clavier, Coats and Dumanoir were applied equally well. By either model, the resistivity formation factor was above that for a clean sand, even though the clay content of the core plugs seemed to be low.

15314 **Formation evaluation and gas detection in shallow, low-permeability shaly sands of the northern Great Plains province.** Kukal, G.C. pp 85-98 of SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

Montana log, core, and production data are combined with geology in a systematic approach for improved log analysis of shallow Upper Cretaceous gas sands having a high silt-clay content. Qualitative (overlay) techniques are reviewed with emphasis upon the normalized Δt - compensated neutron overlay for gas detection. Log interpretation of the Bowdoin Member of the Carlile Shale and Eagle Sandstone in the area peripheral to the Bowdoin Dome Field is discussed in detail. Porosity tool responses are examined with respect to observed lithology and mineralogy. Lithology cross-plots when compared to predicted log responses may be an aid in detecting the presence of gas and minerals that could be related to natural fracture systems (e.g., gypsum, pyrite). Quantitative techniques for estimation of effective porosity, volume clay, and water saturation are presented. The Total Shale Relation appears to give useful water saturation values. Log parameters relating to this equation are generalized and refined.

0303 Drilling, Production, And Processing

REFER ALSO TO CITATION(S) 15282, 15285, 15311

15315 **(DOE/ET/12138—T1(Vol.1)) Analysis of the structural parameters that influence gas production from the Devonian shale. Annual progress report, 1979-1980.** Negus-de Wys, J.; Dixon, J.M.; Evans, M.A.; Lee, K.D.; Ruotsala, J.E.; Wilson, T.H.; Williams, R.T. (West Virginia Univ., Morgantown (USA). Dept. of Geology and Geography). Oct 1980. 35p. NTIS, PC A03/MF A01.

The executive study presents the results and progress of efforts toward understanding shale gas production from the Devonian shale in Appalachia. A correlation was found between the geochemical parameters of the shale in eastern Kentucky and shale gas production there. Tasks on resource inventory tasks and shale characterization include regional structure studies, production studies, geophysical studies, structure studies, fracture density and orientation, and fracture studies. (DLC)

15316 **Gas recovery from tight formations: a function of technology and economics.** Kuuskraa, V.A.; Brashear, J.P.; Elkins, L.F.; Morra, F. Jr. Contract EF-77-C-01-2705;ET-78-C-01-2628. pp 57-68 of SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

Thirteen tight gas basins were analyzed in detail to assess their production potential under alternative levels of economic incentives and technology improvements. Additional analyses were conducted to assess the impact of selected development constraints (drilling, well stimulation, and pipelines) and to test the importance of individual technology improvements to overall performance. The analysis yields to estimates of ultimate recovery ranging from 70 to 108 Tcf at prices ranging from $1.75 to $4.50 per Mcf without accelerated R and D; and from 149 to 188 Tcf with significant technology advances. The technology improvements that appear to have the largest impact on ultimate recovery and net present value include (where applicable): improved ability to differentiate and characterize the gas reservoirs; capacity to stimulate multiple reservoirs for a common wellbore; improved predictability of fracture performance; increased effectively propped fracture length; ability for fractures to intersect lenses not directly in contact with the well; and optimizing field development (well spacing, siting, and frac size). 5 figures.

0305 Health And Safety

15317 (PNL—3700(Pt.2), pp 119) **Assessment of environmental health and safety issues associated with the commercialization of unconventional gas recovery.** Riedel, E.F.; Cowan, C.E. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The purpose of this project is to identify and evaluate known, potential, and heretofore unknown environmental and safety concerns associated with the recovery of natural gas from Unconventional Gas Resources (UGR). Results from these studies will be used by DOE to evaluate the commercialization of these important resources.

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 15290, 15291, 15740

0308 Environmental Effects

REFER ALSO TO CITATION(S) 15317, 16123

15318 (AD-A—084339) Dispersion of vapor from LNG spills: simulation in a meteorological wind tunnel of spills at China Lake Naval Weapons Center, California. Final report. Neff, D.E.; Meroney, R.N. (Colorado State Univ., Fort Collins (USA). Fluid Mechanics and Diffusion Lab.). Mar 1979. Contract DOT-CG-75279-A. 91p. NTIS, PC A05/MF A01.

Physical simulation of a series of four, six cubic meter Liquefied Natural Gas (LNG) spills on water was provided by the Meteorological Wind Tunnel facilities at Colorado State University. Field data were collected from spills performed at Naval Weapons Center, China Lake, California, in Fall 1978. The simulation test series was to provide field test planning information, extend the value of a limited set of field measurements, and validate the concept of physical modeling of LNG plume dispersion as a predictive hazard analysis tool. Two test series were conducted to aid in placement of field concentration measurement instrumentation. The first utilized 1:170 scale model of the China Lake site in the Meteorological Wind Tunnel and the second utilized 1:85 scale model in the Environmental Wind Tunnel. Dispersion data collected in the four field tests at China Lake were extended in two test series conducted in the Environmental Wind Tunnel over a 1:85 scale model. The following results were obtained: (1) comparison between dispersion data for similar test parameters but at two different model scales, 1:85 and 1:170 produces similar concentration variation; (2) the China Lake surface roughness and topography causes the LNG vapor plume to disperse more rapidly than would be experienced over flat terrain; and (3) for the four simulated LNG field tests the arrival time, peak concentration, maximum peak, etc., have been tabulated; peak ground level concentration contours have been determined; and normalized peak concentration coefficients vs. downwind distance have been plotted.

0309 Artificial Stimulation

REFER ALSO TO CITATION(S) 15316

15319 (DOE/METC/08089—115) Coalbed methane production case histories. (TRW Energy Engineering Div., McLean, VA (USA)). Feb 1981. Contract AC21-78MC08089. 38p. NTIS, PC A03/MF A01.

The production of methane gas from coal and coal-bearing rocks is one of the prime objectives of the Department of Energy's Methane Recovery from Coalbeds Project. This report contains brief description of wells that are presently producing gas from coal or coal-bearing rocks. Data from three gob gas production areas in Illinois, an in-mine horizontal borehole degasification, and eleven vertical boreholes are presented. Production charts and electric logs of the producing zones are included for some of the wells. Additional information on dry gas production from the San Juan Basin, Colorado/New Mexico and the Greater Green River Coal Region, Colorado/Wyoming is also included.

15320 SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979). 357p. (CONF-790514—).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

Thirty-four papers are included. Separate abstracts were prepared for 33 of the papers; the remaining paper was previously abstracted. (DLC)

15321 Experimental evaluation of fracturing fluid interaction with tight reservoir rocks and propped fractures. Ahmed, U.; Abou-Sayed, A.S.; Jones, A.H. Contract EF-76-C-53030; EF-46-8014; EF-78-C-03-1547; EY-76-C-08-0680. pp 109-126 of SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

This study demonstrates that when fracturing fluid damage is included in the stimulation ratio calculations, good agreement with actual post fracturing production can be achieved. Laboratory experiments at simulated in situ conditions (stress, temperature, saturation and fracturing treatment procedure) on actual core samples were performed to assess fracturing fluid damage to both the matrix permeability and propped fracture conductivity; damage was found to be site specific. Laboratory data on cores from unconventional gas reservoirs in both the Eastern and Western parts of the US are presented. The observed damage is identified and explained. Specific examples are presented and predicted production compared with post-fracturing flow. Good agreement was obtained. 25 figures. 6 tables.

15322 Particle size distributions generated by crushed proppants and their effects on fracture conductivity. Carroll, H.B. Jr.; Baker, B.A. pp 127-137 of SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

Research conducted in the tight gas sands of the Piceance, Uinta, and Green River Basins of Colorado, Utah, and Wyoming is directed toward evaluating massive hydraulic fracturing (MHF) for increasing natural gas production. Research supporting the Western Gas Sands Project consists of examining potential areas of formation damage by MHF fluids and proppants. Fractures produced by the MHF process are propped open by placement of particulate materials creating zones of high permeability and porosity. In this research, high permeability fractures were simulated by placing 40/60 mesh sand proppant between core halves, and subjecting the cores to increasing overburden pressure. As the proppant was crushed, the resultant particles were transported through the propped fracture by frac fluids. Mean, mode, and number per unit volume of the produced particle size distributions were measured and related to overburden pressure. The effects of particle retention, when pumping similar particle distributions through the propped fracture, were detected by a pressure change across the core. Measured changes in the filtration efficiency, conductivity, and threshold plugging pressure of the propped fracture showed significant particle trapping within the porous media. Pressure versus time plots indicate successive pore plugging and particle breakthrough until the fracture is ultimately plugged.

15323 Application of sintered bauxite proppants to stimulation of low permeability south Texas gas reservoirs. Atteberry, R.D.; Tucker, R.L.; Ritz, J.W. pp 139-149 of SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

High-strength sintered bauxite proppants were introduced to the petroleum industry in late 1976 to provide fracture support under high closure pressure conditions. They have been subsequently applied to fracture design in Vicksburg Sand, Edwards Limestone, Wilcox Sand, Frio Sand, and Sligo Limestone formations of South Texas. Laboratory tests of the sintered bauxite proppant with formation core samples were conducted that demonstrated superior flow capacities to sand under the higher closure pressures existing under producing conditions. Results as evaluated by various pressure response data and production histories indicate significant improvement in stimulation of these reservoirs due to the sintered bauxite proppant.

15324 Pressure transient analysis of tight western gas sands: pre- and post- fracturing. Kennedy, J.H. McElhiney, J.E. Contract ET-78-C-08-1557. pp 219-232 of SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

In the last several years a series of massive hydraulic fracturing (MHF) experiments were conducted in the Upper Cretaceous formations of the Rocky Mountain gas provinces. The purpose of these large stimulation treatments is to enhance the productivity of these low permeability reservoir systems so that commercial eco-

nomics will become a reality. The initial stage of this study encompasses the pressure transient analysis of various tests run in several different MHF projects. Some of the preliminary results for the Mobil F31-13G well located in the Piceance Creek Gas Field, located in Rio Blanco County, Colorado, are reported here. These results are fraught with a variety of difficulties; these problems are discussed and recommendations for improvements in future pressure testing programs associated with MHF programs are made.

15325 **Geological characteristics and engineering capabilities of wells 31-13 and 498-4-1.** Timmerman, E.H.; Collins, T.; Ishteiwy, A.A.; Chancellor, R.E.; van Poollen, H.K. pp 271-287 of SPE-AIME symposium on low-permeability gas reservoirs. Dallas, TX; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1979).

From Symposium on low-permeability gas reservoirs; Denver, CO, USA (20 May 1979).

Two wells in the Northern Piceance Basin were variably stimulated in correlative Mesaverde rocks. The well which encountered the rock sequence at greater depth in the presence of more intensive natural fracturing had better productive characteristics and better before and after flow capacity. Geology, flow data and buildup data are in agreement. The data also indicate that the overall net benefit of massive fracture is about the same as obtainable from a moderate size fracture job. Methods used to analyze the buildup tests are illustrated. Selective fracturing of available individual gas zones using moderate sized operations per zone is useful. Hopefully, a technique can be developed which, in the field, will attain benefits indicated by theory to be obtainable from massive fractures in Western Tight Gas pays. Frac fluids can be displaced today, but results are less than desired.

0310 Legislation And Regulation

REFER ALSO TO CITATION(S) 15295, 15296

0330 Properties

REFER ALSO TO CITATION(S) 15903

0350 Storage

15326 **(CONF-790309—) [Proceedings of seminar and study tour on LNG peakshaving].** (United Nations, Geneva (Switzerland). Economic Commission for Europe). 1979. 151p. NTIS (US Sales Only), PC A08/MF A01.

From United Nations Economic and Social Council seminar and study tour on LNG peak shaving; Washington, DC, USA (5 Mar 1979).

Topics discussed included design and operation, LNG storage, LNG facility regulations, peak shaving plants, personnel training, economics, and safety. (DLC)

04 OIL SHALES AND TAR SANDS

0402 Site Geology And Hydrology

REFER ALSO TO CITATION(S) 15304, 15305, 15306, 15307, 15308, 15309, 15310, 15311, 15312, 15315

0403 Drilling, Fracturing, And Mining

15327 **(LA—8500-PR) Explosively produced fracture of oil shale. Progress report, October-December 1979.** Morris, W.A. (comp.). (Los Alamos Scientific Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 17p. NTIS, PC A02/MF A01.

A Jones-Wilkins-Lee (JWL) equation of state for ammonium nitrate/fuel oil mixture (ANFO) and aluminized ANFO, somewhat different from the Becker-Kistiakowsky-Wilson (BKW) equation of state described in previous reports, is discussed. Included also are our present understanding of a steady, cylindrical detonation, a proposed computer model of a real detonation, the requirements for an equivalent equation of state to be used with the model, and the values for the equation-of-state parameters. An alternative explosive burn package has been implemented in the computer code YAQUI together with a slip-line capability at the explosive/oil shale interface. The code has been used for prediction of cratering and fragmentation experiment results on a field scale.

15328 **(LA—8501-PR) Explosively produced fracture of oil shale. Progress report, January-March 1980.** Morris, W.A. (comp.). (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 22p. NTIS, PC A02/MF A01.

A detailed study was made for cratering experiment 78-1, fired in 1978 using a special version of the YAQUI stress wave propagation code, called the Bedded Crack Model (BCM). The BCM simplifies the calculations with the assumption that all the existing cracks are in the bedding planes of the oil shale. Determinations are made for the minimum and maximum initial crack sizes in the shale, and for experiment 78-1, the sensitivity of crater formation to crack size is shown for its depth of burial. The crater profiles predicted with this model are in excellent agreement with the experiment. Also, a description is given for a method for numerical modeling of rock fragmentation that has been developed using a statistical approach to estimate the effect of flaws on rock masses. This approach has the advantage over plasticity models because it accounts for both strain-rate and crack-size effects without introducing additional parameters and makes use of fundamental physical ideas concerning the behavior of cracks rather than empirical data fitting. The general theory accounts for the effects of open cracks and closed cracks separately, with the effect of interfacial friction on closed cracks playing an important role. In addition, a method is shown that will allow inference of the three-dimensional distribution of cracks in rock media from the distribution on an outcropping.

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 15192

15329 **(DOE/ET/14102—T1) Synthetic fuels from US oil shales: a technical and economic verification of the Hytort Process. Annual report, October 1, 1979-September 30, 1980.** (Institute of Gas Technology, Chicago, IL (USA)). Mar 1981. Contract AC20-79ET14102. 169p. NTIS, PC A09/MF A01.

Five tasks are reported on: laboratory programs, bench-scale program, PDU tests, process environmental assessment, and process design and economics. (DLC)

15330 **(LBL—12019) Corrosion of metals in oil shale environments.** Levy, A.; Bellman, R. Jr. (Lawrence Berkeley Lab., CA (USA)). Dec 1980. Contract W-7405-ENG-48. 27p. (CONF-810402—10). NTIS, PC A03/MF A01.

From Corrosion/81 annual meeting; Toronto, Canada (6 Apr 1981).

In the corrosion of mild, low alloy and stainless steel in elevated temperature in-situ oil shale retorting environments is being investigated. The catastrophic oxidation-sulfidation attack that can occur in in-situ retorts is documented for a thermowell consisting of a mild steel pipe protecting a stainless steel sheathed thermocouple assembly. The behavior of metals under a number of varying conditions such as service temperature, type of shale and oil content of shale is presented. The potential of coatings on mild steel to extend its service range into shale retorting environments has been determined for pack aluminide type coatings.

15331 **(SAND—81-6002) Process and arrangement for extracting oil from shale.** Ljuengstroem, F. Feb 1981. Translation of . Swedish Patent 129,838. 11p. NTIS, PC A02/MF A01.

The shale is first heated by means of a hot fluid and then by electrical means to the final dry-distillation temperature. The fluid and electric heating takes place in a housing or sheath inserted in the same hole in the shale. The preheating preferably takes place

first with saturated steam at high pressure and then with superheated steam at low pressure. The housing/sheaths are considerably longer vertically than the electrical resistance so that the steam imparts heat to the surrounding rock. (DLC)

15332 **Corrosion of metals in oil shale retorting operations.** Levy, A.V. (Lawrence Berkeley Lab., CA). pp 3.1-3.17 of Materials and corrosion problems in energy systems. Lochmann, W.J.; Indig, M. (eds.). Houston, TX; National Association of Corrosion Engineers (1980).

From Energy-sources technology conference; New Orleans, LA, USA (3 Feb 1980).

In situ retorting of oil shale using combustion reactions in the shale body itself to provide heat for pyrolysis of the organic product, kerogen, in the marlstone rock produces environments that are highly corrosive to low alloy and stainless steels. The need to monitor the underground combustion zones to control the extraction of kerogen requires the use of thermocouple wells that must endure all of the temperature-time regimes in a retorting operation. Temperatures as high as 2000°F and high sulfur activities from the shale combine to attack the stainless steel sheaths used to protect the thermocouples from the shifting rock during retorting. Other metallic components required to be exposed to the elevated temperature corrosion conditions in the in situ retorts are also subject to attack.

15333 **Challenge of efficiently retorting very nonuniform beds of oil shale rubble.** Galloway, T.R. (Univ of Calif, Lawrence Livermore Lab). *In Situ ;* **3**: No. 4, 279-330(1979).

Recent experimental pilot-scale retort work has shown significant declines in oil recovery yield as the size of the shale block increases. This paper reviews current analyses of the problem, together with experimental evidence for the key fluid-mechanical, heat-transfer, and mass-transfer processes that cause these lower yields. Loss in retort oil yield is found to be dominated by the flow patterns in the matrix material around the large blocks and by the thermal transient characteristics within the blocks. Use of process-control methods involving air-steam ratio, total flow, and flow variations coupled with monitored exit-gas composition appears feasible to maximize oil production. 55 refs.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 15229, 15976

15334 **dc electrical conductivity of Green River oil shales.** Rajeshwar, K.; Das, M.; DuBow, J. (Colorado State Univ., Fort Collins). *Nature (London) ;* **287**: 131-133(11 Sep 1980).

How oil shale kerogen decomposes to gaseous and liquid hydrocarbon fuels is not fully understood. The present study considers the dc electrical conduction behaviour of Green River oil shales. The observed trends in the electrical behaviour of these materials are correlated with a two-step decomposition model in which the rate-determining processes are shown to be (1) breakdown of an outershell polar bridge structure with an activation energy of 15 to 2 kcal mol^{-1} (180 to 350°C) and (2) cleavage of an inner core naphthenic structure also involving polar groups with an activation energy of 35 +- 3 kcal mol^{-1} (350 to 500°C). These structural changes are shown to correspond to the chemical transformation of kerogen to liquid and gaseous hydrocarbons through a bitumen intermediate. 2 figures, 1 table.

0408 Marketing And Economics

REFER ALSO TO CITATION(S) 15291

0409 Waste Research And Management

15335 **(LBL—12124) Removal of contaminative constituents from retort water: difficulties with biotreatment and potential applicability of raw and processed shales.** Jones, B.M.; Sakaji, R.H.; Fox, P.; Daughton, C.G. (California Univ., Berkeley (USA)). 1980. Contract W-7405-ENG-48. 6p. (CONF-801245—2). NTIS, PC A02/MF A01.

From EPA/DOE workshop on shale oil wastewater disposal; Denver, CO, USA (2 Dec 1980).

Traditional and novel methods for the treatment of water from in-site retorting are discussed. The use of microorganisms for upgrading wastewater is described. Also discussed is the feasibility of using low or spent shales to effect inorganic and organic constituent removal. Problems in developing suitable methods for the treatment of retort wastewater are described. (DMC)

0410 Enviromental Aspects

REFER ALSO TO CITATION(S) 16126

15336 (PNL—3700(Pt.2), pp 43-46) **Terrestrial effects of oil shale development.** Wildung, R.E.; Garland, T.R.; Zachara, J.M. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The potential development of the oil shale industry requires the concomitant development of methodology to evaluate and ameliorate the environmental impact of ground disposal of wastes. Therefore, research programs have emphasized development of sampling protocols with industry, collection of samples from a range of retort processes, and physicochemical characterization of retort waters, retorted shales, retorted shale leachates, ground waters and soils of the oil shale region, and the hydrologic factors governing transport to ground waters.

15337 (PNL—3700(Pt.2), pp 51-61) **Ecological effects of coal conversion (SRC-II). Toxicology of SRC-I materials.** Bean, R.M.; Becker, C.D.; Cline, J.F.; Dauble, D.D.; Emery, R.M.; Felice, L.J.; Skalski, J.R.; States, J.B. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Synfuels ecological research tasks are organized under aquatic, terrestrial, and chemical studies. Aquatic Studies are further subdivided into acute, chronic, and ecosystems-level studies, including an interlaboratory comparison. The rationale, methods, and results of each task are briefly described.

15338 (PNL—3700(Pt.4), pp 113-127) **Oil shale and tar sand research.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

Oil shale and tar sand in the United States represent a potential supply of nearly one trillion barrels of crude oil for the country's future use. Because of the complex nature of the effluents, new sampling, analysis, and chemical separation procedures have had to be developed. In this section, new and improved techniques for organic, inorganic, and speciation analysis are presented with applications for oil shale research. Also reported is the progress of a program to provide representative and well-characterized fossil-fuel samples for environmental and health effects studies and for interlaboratory comparisons to ensure accuracy of the data.

05 NUCLEAR FUELS

0501 Reserves

15339 **(GJBX—45-81) Uranium in granites from the Southwestern United States: actinide parent-daughter systems, sites and mobilization. First year report.** Silver, L.T.; Williams, I.S.; Woodhead, J.A. (California Inst. of Tech., Pasadena (USA). Div. of Geological and Planetary Sciences). Oct 1980. Contract AC13-76GJ01664. 277p. NTIS, PC A13/MF A01.

Some of the principal findings of the study on the Lawler Peak Granite are: the granite is dated precisely by this work at 1411 +- 3 m.y., confirming its synchroneity with a great regional terrane of granites. Uranium is presently 8-10 times crustal abun-

dance and thorium 2-3 times in this granite. Uranium is found to be enriched in at least eight, possibly ten, primary igneous mineral species over the whole-rock values. Individual mineral species show distinct levels in, and characteristics ranges of, uranium concentration. It appears that in a uraniferous granite such as this, conventional accuracy mineral suites probably cannot account for most of the uranium in the rock, and more rare, high U-concentration phases also are present and are significant uranium hosts. It appears that at least two different geological episodes have contributed to the disturbance of the U-Th-Pb isotope systems. Studies of various sites for transient dispersal of uranium, thorium, and radiogenic lead isotopes indicate a non-uniform dispersal of these components. It appears that the bulk rock has lost at least 24 percent of its original uranium endowment, accepting limited or no radiogenic lead or thorium migration from the sample.

15340 **(GJBX—258(80)(App.)) Cordilleran metamorphic core complexes and their uranium favorability.** Coney, P.J.; Reynolds, S.J. (Arizona Univ., Tucson (USA). Dept. of Geosciences). Nov 1980. Contract AC13-76GJ01664. 301p. NTIS, PC E11/MF $3.50.

The objective of this report is to provide a descriptive body of knowledge on Cordilleran metamorphic core complexes including their lithologic and structural characteristics, their distribution within the Cordillera, and their evolutionary history and tectonic setting. The occurrence of uranium in the context of possibility for uranium concentration is also examined. This volume contains appendices of the following: annotated bibliography of Cordilleran metamorphic core complexes; annotated bibliography of the uranium favorability of Cordilleran metamorphic core complexes; uranium occurrences in the Cordilleran metamorphic core complex belt; and geology, uranium favorability, uranium occurrences and tectonic maps of individual Cordilleran metamorphic core complexes; and locations, lithologic descriptions, petrographic information and analytical data for geochemical samples.

15341 **(K/UR—46) Uranium resource evaluation project quality assurance evaluation.** Grimes, J.G. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 28 Feb 1981. Contract W-7405-ENG-26. 75p. NTIS, PC A04/MF A01.

This evaluation was conducted over an eight-month period from February 4 through October 1, 1980. During this time, field sampling was suspended for an indefinite time period while the National Uranium Resource Evaluation (NURE) Program underwent restructuring. In addition, the Uranium Resource Evaluation (URE) Project archives are being restructured. Since it is difficult to evaluate quality assurance needs of a program that is undergoing drastic change and because sections of the evaluation were well along before these changes were announced, this evaluation reflects the situation as it was during February 1980. The following quality assurance related programs are continuing to date: (1) periodic checks of field sampling procedures by the Supervising Field Geologist and the Director of Field Operations; (2) verification of field form information and laboratory analytical data verification for all geochemical surveys; (3) URE Project laboratory quality control program (all elements routinely analyzed); and (4) Ames interlaboratory quality control program (uranium only). UCC-ND was given the responsibility of conducting a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) survey in the Central United States (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Texas, South Dakota, and Wisconsin). During 1979 and 1980, 13 detailed surveys were conducted by the URE Project in the Central and Western United States to characterize the hydrogeochemistry, stream sediment geochemistry, and/or radiometric patterns of known or potential uranium occurrences. Beginning in 1980, the HSSR surveys were modified to the Regional Hydrogeochemical and Stream Sediment (RHSS) surveys.

15342 **(LA—8734-PR) Geostatistics project of the National Uranium Resource Evaluation Program. Progress report, April-September 1980.** Johnson, M.E.; Howell, J.A.; Jackson, C.K.; Patterson, D.; Beckman, R.J.; Campbell, K.; Bement, T.R. (Los Alamos Scientific Lab., NM (USA)). Mar 1981. Contract W-7405-ENG-36. 11p. NTIS, PC A02/MF A01.

A large computer code was written to perform a number of discriminant analysis procedures on aerial radiometric data. Work on percentile estimation, using the normal and log-normal probability distributions, was extended. Additional work was performed on methods of computing with large data sets. Attempts are being made to evaluate the behavior of principal components analysis relative to element distribution in a survey area. We also provided general statistical consulting in such areas as discriminant analysis, filtering, and kriging.

0502 Exploration

15343 **(GJBX—21(81)) Spectral gamma-ray logging studies.** Wilson, R.D.; Stromswold, D.C. (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Jan 1981. Contract AC13-76GJ01664. 187p. NTIS, PC A09/MF A01.

This is a progress report on spectral gamma-ray logging studies conducted during the period from 1978 to 1980. Its contents first appeared as a series of unpublished technical notes. The series has now been edited and compiled. The ten technical notes are: calibration, KUT background corrections; borehole water factor corrections; casing correction factors; signal deconvolution; results of dynamic logging of the calibration models; energy stabilization methods; log deconvolution;with the inverse digital filter; interpretation of high resolution gamma-ray transport calculations; and comparison of sodium iodide, cesium iodide, and bismuth germanate scintillators for borehole gamma-ray logging.

15344 **(GJBX—66(81)) Sedimentology and uranium potential of the Inyan Kara Group, near Buffalo Gap, South Dakota. Final report.** Dandavati, K.S.; Fox, J.E. (South Dakota School of Mines and Technology, Rapid City (USA)). Apr 1980. Contract AC13-76GJ01664. 137p. NTIS, PC E05/MF $3.50.

Includes 3 sheets of 24 reduction microfiche.

Sedimentary structures, along with textural and compositional evidence gathered from two stratigraphic sections of the Lower Cretaceous Inyan Kara Group in Calico and Fuson Canyons on the southeastern flank of the Black Hills, suggest the following depositional framework: the basal, Chilson Member of the Lakota Formation consists of a series of upward fining sequences deposited in point-bar and flood-plain environments of a northeasterly flowing, meandering river system. Fluvial sandstones in the Chilson include channel-fill, channel margin, crevasse microdelta and levee facies. The Minnewaste Limestone Member and the lower part of the overlying Fuson Member of the Lakota Formation were deposited in low-energy, lacustrine environments. Flood oriented tidal-delta facies overlain by tidal flat deposits in the upper part of the Fuson Member suggest an earlier incursion of the initial Cretaceous seaway, at least locally, than previously documented in the region. Lower Fall River deposits represent northeast-trending barrier bar and northwest-trending deltaic distributary mouth bar facies, reflecting an increase in sediment supply. Upper Fall River sandstones include distributary mouth bar and lower foreshore deposits. Altered sandstones of the basal Chilson Member and the lower part of the Fuson Member in Calico Canyon contain anomalous values of U_3O_8. Fossil wood and bone samples are also enriched in trace elements of U, V, and Mo, suggesting that uranium-bearing solutions might have passed through porous and permeable sandstones of the study area, possibly flowing toward the northeast along Chilson paleochannels.

15345 **(GJBX—70(81)) Glens Falls 1^0 x 2^0 NTMS area, New Hampshire, New York, and Vermont. Supplemental data report: National Uranium Resource Evaluation program, hydrogeochemical and stream sediment reconnaissance.** Cook, J.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Feb 1981. Contract AC09-76SR00001. 18p. (DPST—79-146-3S). NTIS, PC E02/MF $3.50.

Includes 4 sheets of 24 reduction microfiche.

This data report presents supplemental analytical results for 980 stream sediment samples that were collected as part of the SRL-NURE reconnaissance in the National Topographic Map Series (NTMS) Glens Falls 1^0 x 2^0 quadrangle. Results are reported for 23 elements (extractable U, Ag, As, Ba, Be, Ca, Co, Cr, Cu, K,

Li, Mg, Mo, Nb, Ni, P, Pb, Se, Sn, Sr, W, Y, and Zn). Analyses are tabulated and displayed graphically on microfiche. Field data and neutron activation analysis (NAA) were open-filed in DPST-79-146-3 [GJBX-44(79)].

15346 **(GJBX—71(81)) Newark 1° x 2° NTMS area, New Jersey, New York, and Pennsylvania. Supplemental data report: National Uranium Resource Evaluation program, hydrogeochemical and stream sediment reconnaissance.** Cook, J.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Feb 1981. Contract AC09-76SR00001. 19p. (DPST—79-146-9S). NTIS, PC E02/MF $3.50.

Includes 4 sheets of 48 reduction microfiche.

Supplemental analytical results for 834 stream sediment samples that were collected as part of the SRL-NURE reconnaissance in the National Topographic Map Series (NTMS) Newark 1° x 2° quadrangle are presented. Results are reported for 23 elements (extractable U, Ag, As, Ba, Be, Ca, Co, Cr, Cu, K, Li, Mg, Mo, Nb, Ni, P, Pb, Se, Sn, Sr, W, Y, and Zn). Analyses are tabulated and displayed graphically on microfiche. Field data and neutron activation analysis (NAA) were open-filed in DPST-79-146-9 [GJBX-128(80)].

15347 **(GJBX—72(81)) Boston 1° x 2° NTMS area, Massachusetts and New Hampshire. Supplemental data report: National Uranium Resource Evaluation program, hydrogeochemical and stream sediment reconnaissance.** Cook, J.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Feb 1981. Contract AC09-76SR00001. 18p. (DPST—80-146-19S). NTIS, PC E02/MF $3.50.

Includes 4 sheets of 24 reduction microfiche.

This data report presents supplemental analytical results for 669 stream sediment samples that were collected as part of the SRL-NURE reconnaissance in the National Topographic Map Series (NTMS) Bostom 1° x 2° quadrangle. Results are reported for 23 elements (extractable U, Ag, As, Ba, Be, Ca, Co, Cr, Cu, K, Li, Mg, Mo, Nb, Ni, P, Pb, Se, Sn, Sr, W, Y, and Zn). Analyses are tabulated and displayed graphically on microfiche. Field data and neutron activation analysis (NAA) were open-filed in DPST-80-146-19 [GJBX-255(80)].

15348 **(GJBX—73(81)) Roanoke 1° x 2° NTMS area, Virginia. Data report (abbreviated): National Uranium Resource Evaluation program, hydrogeochemical and stream sediment reconnaissance.** Cook, J.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Dec 1980. Contract AC09-76SR00001. 18p. (DPST—80-146-27). NTIS, PC E02/MF $3.50.

Includes 9 sheets of 24 reduction microfiche.

This abbreviated data report presents results of ground water and stream sediment reconnaissance in the National Topographic Map Series Roanoke 1° x 2° quadrangle. Surface sediment samples were collected at 1235 sites. Ground water samples were collected at 767 sites. Neutron activation analysis results are given for uranium and 16 other elements in sediments, and for uranium and 8 other elements in ground water. Field measurements and observations are reported for each site. Analytical data and field measurements are presented. Data from ground water sites include (1) water chemistry measurements (pH, conductivity, and alkalinity), (2) physical measurements where applicable (water temperature, well description, etc.), and (3) elemental analyses (U, Al, Br, Cl, Dy, F, Mn, Na, and V). Data from sediment sites include (1) stream water chemistry measurements (pH, conductivity, and alkalinity), and (2) elemental analyses for sediment samples (U, Th, Hf, Al, Ce, Dy, Eu, Fe, La, Lu, Mn, Sc, Sm, Na, Ti, V, and Yb). Sample site descriptors (stream characteristics, vegetation, etc.) are tabulated. Areal distribution maps, histograms, and cumulative frequency plots for most elements and for U/Th and U/Hf ratios are included. Key data from stream water sites include (1) water quality measurements (pH, conductivity, and alkalinity) and (2) elemental analyses (U, Al, Br, Cl, Dy, F, Mg, Mn, Na, and V). Uranium concentrations in the sediments range from 0.50 to 83.50 ppM with a mean of 6.67 ppM. A cluster of high log (U/Th + Hf) ratios appear in the southeastern portion of the quadrangle. Uranium, thorium, and the rare earth elements show a striking correlation with the geology of the area.

15349 **(GJBX—74(81)) Aerial radiometric and magnetic survey: Preston National Topographic Map, Idaho/Wyoming Rockies wrap-up Project. Final report.** (Geodata International, Inc., Dallas, TX (USA)). 1981. Contract AC13-76GJ01664. 310p. NTIS, PC E14/MF $13.25.

Includes 62 sheets of 48 reduction microfiche.

The results of analyses of the airborne gamma radiation and total magnetic field survey flown for the region identified as the Preston National Topographic Map NK12-5 are presented. The airborne data gathered are reduced by ground computer facilities to yield profile plots of the basic uranium, thorium and potassium equivalent gamma radiation intensities, ratios of these intensities, aircraft altitude above the earth's surface, total gamma ray and earth's magnetic field intensity, correlated as a function of geologic units. The distribution of data within each geologic unit, for all surveyed map lines and tie lines, has been calculated and is included. Two sets of profiled data for each line are included, with one set displaying the above-cited data. The second set includes only flight line magnetic field, temperature, pressure, altitude data plus magnetic field data as measured at a base station. A general description of the area, including descriptions of the various geologic units and the corresponding airborne data, is included.

15350 **(GJBX—76(81)) Aerial radiometric and magnetic survey: Kalispell National Topographic Map, Montana Rockies wrap-up Project. Final report.** (Geodata International, Inc., Dallas, TX (USA)). 1981. Contract AC13-76GJ01664. 258p. NTIS, PC E12/MF $10.55.

Includes 54 sheets of 48 reduction microfiche.

The results of analyses of the airborne gamma radiation and total magnetic field survey flown for the region identified as the Kalispell National Topographic Map NM11-12 are presented. The airborne data gathered are reduced by ground computer facilities to yield profile plots of the basic uranium, thorium and potassium equivalent gamma radiation intensities, ratios of these intensities, aircraft altitude above the earth's surface, total gamma ray and earth's magnetic field intensity, correlated as a function of geologic units. The distribution of data within each geologic unit, for all surveyed map lines and tie lines, has been calculated and is included. Two sets of profiled data for each line are included, with one set displaying the above-cited data. The second set includes only flight line magnetic field, temperature, pressure, altitude data plus magnetic field data as measured at a base station. A general description of the area, including descriptions of the various geologic units and the corresponding airborne data, is included.

0503 Mining

15351 (PNL—3700(Pt.2), pp 133) **Technology assessment of in situ uranium mining.** Cowan, C.E. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The objective of the PNL portion of the Technology Assessment project is to provide a description of the current in situ uranium mining technology; to evaluate, based on available data, the environmental impacts and, in a limited fashion, the health effects; and to explore the impediments to development and deployment of the in situ uranium mining technology.

0504 Feed Processing

15352 **(ORNL/TM—7652) Uranium recovery from low-level aqueous sources.** Kelmers, A.D.; Goeller, H.E. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 48p. NTIS, PC A03/MF A01.

The aqueous sources of soluble uranium were surveyed and evaluated in terms of the uranium geochemical cycle in an effort to identify potential unexploited resources. Freshwater sources appeared to be too low in uranium content to merit consideration, while seawater, although very dilute (~ 3.3 ppB), contains ~ 4 x 10^9 metric tons of uranium in all the world's oceans. A literature review of recent publications and patents concerning uranium recovery from seawater was conducted. Considerable experimental work is currently under way in Japan; less is being done in the Eu-

ropean countries. An assessment of the current state of technology is presented in this report. Repeated screening programs have identified hydrous titanium oxide as the most promising candidate absorbent. However, some of its properties such as distribution coefficient, selectivity, loading, and possibly stability appear to render its use inadequate in a practical recovery system. Also, various assessments of the energy efficiency of pumped or tidal power schemes for contacting the sorbent and seawater are in major disagreement. Needed future research and development tasks are discussed. A fundamental sorbent development program to greatly improve sorbent properties would be required to permit practical recovery of uranium from seawater. Major unresolved engineering aspects of such recovery systems are also identified and discussed.

15353 **Preparation of $^{233}UO_2$ for the light-water breeder reactor demonstration program.** Parrott, J.R. Sr. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society ;* **34**: 434-435(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

0505 Enrichment

REFER ALSO TO CITATION(S) 15890

15354 **(K/OA—4722) Modern gas centrifuge and rarefied-gas dynamics.** Lowry, R.A.; Halle, E.V.; Wood, H.G. III. (Virginia Univ., Charlottesville (USA); Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.). 30 Mar 1981. Contract W-7405-ENG-26. 40p. (CONF-800715—6). NTIS, PC A03/MF A01.

From 12. international symposium on rarefied gas dynamics; Charlottesville, VA, USA (7 Jul 1980).

Today, the modern gas centrifuge appears to be the preferred method for the enrichment of the isotopes of uranium on a commercial scale. That this is the case is the result of diligent development programs pursued in this country as well as in the UK, Germany, and the Netherlands over the several decades since the end of WW II. The theoretical modelling of gas centrifuge performance has made notable advances. However, the theoretical work has been based primarily on continuum fluid dynamics considerations. Centrifuge problems involving rarefied gas dynamics considerations are discussed in this paper.

15355 (PNL—3700(Pt.2), pp 133) **Technology assessment of advanced isotope separation (uranium enrichment).** Mellinger, P.J. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Additional nuclear fuel is retrievable by recovering uranium (^{235}U) from uranium flouride (UF_6) tails. This potential has led to the establishment of the Advanced Isotope Separation (AIS) program in the Department of Energy.

0507 Fuels Production And Properties

15356 **Transport phenomena in nuclear fuels under severe temperature gradients.** Nichols, F.A. (Argonne Natl Lab, Ill). *Journal of Nuclear Materials ;* **84**: No. 1-2, 1-25(1 Oct 1979).

Fundamental concepts involved in atomic transport phenomena are reviewed in the context of irreversible thermodynamics. The basic theory for the bodily migration of macroscopic particles and pores is developed. These concepts are applied to lenticular void motion and central void formation, fission-gas swelling and gas release, solid fission product redistribution and the redistribution of fuel constituent species. 121 refs.

15357 **On the thermal gradient migration of lenticular voids.** Nichols, F.A. (Argonne Natl Lab, Ill). *Journal of Nuclear Materials ;* **84**: No. 1-2, 319-326(1 Oct 1979).

The velocity of lenticular-shaped voids in UO/sub 2/ placed in a thermal gradient, filled with any except the very lightest gases at /similar/ atmospheric pressures, can be quantitatively predicted by a diffusion control model. The model has also been applied to the case of a mixed oxide of ThO/sub 2/-10 wt% UO/sub 2/. 17 refs.

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 15387, 15391, 15393, 15394, 15395, 15407, 15408, 15728

15358 **(ORNL/TM—7657) Consolidated fuel-reprocessing program. Progress report October 1-December 31, 1980.** Unger, W.E. (comp.). (Oak Ridge National Lab., TN (USA)). Mar 1981. 44p. NTIS, PC A03/MF A01.

This progress report is compiled from major contributions from three previous programs: (1) the Advanced Fuel Recycle Program at ORNL; (2) the Converter Fuel Reprocessing Program at Savannah River Laboratory; and (3) the reprocessing components of the HTGR Fuel Recycle Program primarily at General Atomic and ORNL. The coverage is generally overview in nature. Experimental details and data are limited.

15359 **Remote operations for pyrometallurgical reprocessing experiments.** Nicol, A.G.; Wood, W.T.; Behrens, R.G.; Herrick, C.C. (Los Alamos Scientific Lab., NM). *Transactions of the American Nuclear Society ;* **34**: 432-434(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15360 **Present status of LWR fuels reprocessing technology.** Vondra, B.L.; Crouse, D.J. *AIChE Symposium Series ;* **75**: No. 191, 27-32(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

A discussion is presented of identified potential process problems in LWR fuels reprocessing and considers the technology status with respect to solutions of these problems. The following factors are examined: mechanical processing, dissolution and feed clarification, solvent cleaning, plutonium chemistry, and off-gas treatment. Recent developments are outlined. 15 refs.

0509 Transport And Storage

REFER ALSO TO CITATION(S) 15378, 15945

15361 **(PNL—3540) Comparison of potential radiological consequences from a spent-fuel repository and natural uranium deposits.** Wick, O.J.; Cloninger, M.O. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Sep 1980. Contract AC06-76RL01830. 97p. NTIS, PC A05/MF A01.

A general criterion has been suggested for deep geological repositories containing spent fuel - the repositories should impose no greater radiological risk than due to naturally occurring uranium deposits. The following analysis investigates the rationale of that suggestion and determines whether current expectations of spent-fuel repository performance are consistent with such a criterion. In this study, reference spent-fuel repositories were compared to natural uranium-ore deposits. Comparisons were based on intrinsic characteristics, such as radionuclide inventory, depth, proximity to aquifers, and regional distribution, and actual and potential radiological consequences that are now occurring from some ore deposits and that may eventually occur from repositories and other ore deposits. The comparison results show that the repositories are quite comparable to the natural ore deposits and, in some cases, present less radiological hazard than their natural counterparts. On the basis of the first comparison, placing spent fuel in a deep geologic repository apparently reduces the hazard from natural radioactive materials occurring in the earth's crust by locating the waste in impermeable strata without access to oxidizing conditions. On the basis of the second comparison, a repository constructed within reasonable constraints presents no greater hazard than a large ore deposit. It is recommended that if the naturally radioactive environment is to be used as a basis for a criterion regarding repositories, then this criterion should be carefully constructed. The criterion should be based on the radiological quality of the waters in the im-

mediate region of a specific repository, and it should be in terms of an acceptable potential increase in the radiological content of those waters due to the existence of the repository.

15362 **Feasibility of close-packing fuel rods for geologic disposal of spent fuel.** McNair, G.W.; Gore, B.F. (Battelle Pacific Northwest Labs., Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 406-407(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15363 **Opportunities to increase the productivity of spent-fuel shipping casks.** Franklin, A.L.; DeSteese, J.G. . (Battelle Pacific Northwest Labs., Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 428-429(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

0520 Waste Management

REFER ALSO TO CITATION(S) 15362, 15405, 15407, 15408, 15902, 16107, 16108, 16233

15364 **Application of inorganic sorbents in actinide separations processes.** Schulz, W.W. (Rockwell Hanford Operations, Richland, WA); Koenst, J.W.; Tallant, D.R. *ACS (American Chemical Society) Symposium Series ;* No. 117, 17-32(1980).

This paper summarizes the present status of research which is currently underway at several US Department of Energy laboratories - Rockwell Hanford Operations, Mound Facility, and Sandia Laboratories, Albuquerque - to explore the properties and characteristics of two inorganic sorbents, bone char (a form of calcium hydroxyapatite) and sodium titanate [$Na(Ti_2O_5H)$], in decontaminating liquid waste streams from actinides and in separating americium and curium from lanthanides. Success in this research might lead to a potential breakthrough in plant-scale application of inorganic exchangers in actinide separation schemes.

15365 (DOE/SF/00012—T12, pp 3-41) **Hydrogeologic criteria for selection of low-level radioactive waste disposal sites, with an environmental overview of the Maxey Flats, Kentucky, site.** Lipshie, S.R. (Univ. of California, Los Angeles). Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

In 1963, a facility for the disposal of solid low-level radioactive waste began operation at Maxey Flats, Kentucky. Environmental monitoring in 1972 detected radioactive contaminants in areas adjacent to the disposal site. This study undertakes to identify site conditions contributing to radionuclide dispersal and to enumerate hydrogeologic criteria for use in selecting low-level radioactive waste disposal sites.

15366 (DOE/SF/00012—T12, pp 42-61) **Use of vegetation cover in minimizing water infiltration into trenches at a shallow land burial facility.** Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

The radioactive waste burial site at Maxey Flats, Kentucky, was decommissioned in 1974, due to a suspected seepage of radionuclides into the surrounding environment. The radionuclides are thought to be leaving the site primarily via hydraulic conductance through geological fissures. The entry of water from the surface into the disposal trenches is considered to be a major factor associated with this problem so control of the amount of surface water entering the trenches is critical to restoring the site's stability. Manipulation of the vegetation cover is a primary means of achieving this end.

15367 **(ENICO—1076) Development of submicron particle size classification and collection techniques for nuclear facility off-gas streams.** Hohorst, F.A.; Fernandez, S.J. (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)). Feb 1981. Contract AC07-79ID01675. 45p. NTIS, PC A03/MF A01.

High efficiency particulate air (HEPA) filters are an essential part of nuclear facility off-gas cleanup systems. However, HEPA-rated sampling filters are not the most appropriate samplers for the particle penetrating off-gas cleanup systems. Previous work at the Idaho Chemical Processing Plant (ICPP) estimated perhaps 5% of the radioactivity that challenged sampling filters penetrated them in the form of submicron particles - typically less than 0.2 microns. Accordingly, to evaluate these penetrating aerosols more fully, a suitable robust monitoring system for size differentiation and measurement of submicron particles was developed. A literature survey revealed that the diffusion battery was the best choice for particle size classification and that the electrofluidized bed was the best method for particle collection in ICPP off-gas streams. This report describes the laboratory study and in-plant demonstration of these two techniques.

15368 (PNL—3700(Pt.2), pp 115) **Assessment of effectiveness of geologic isolation systems.** Soldat, J.K.; Napier, B.A.; Strenge, D.L.; Schreckhise, R.G.; Zimmerman, M.G. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The program for Assessment of Effectiveness of Geologic Isolation Systems (AEGIS) is managed through PNL's Water and Land Resources Department and is funded through the Battelle Office of Nuclear Waste Isolation (ONWI). The Ecological Sciences Department was involved in two subtasks under AEGIS: Dose Methodology Development and Reference Site Initial Analysis (RSIA) for a Salt Dome.

15369 (PNL—3700(Pt.2), pp 117) **Hanford defense waste studies.** Napier, B.A.; Zimmerman, M.G.; Soldat, J.K. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

PNL is assisting Rockwell Hanford Operations to prepare a programmatic environmental impact statement for the management of Hanford defense nuclear waste. The Ecological Sciences Department is leading the task of calculation of public radiation doses from a large matrix of potential routine and accidental releases of radionuclides to the environment.

15370 (PNL—3700(Pt.2), pp 123-124) **Rockwell support studies.** Cadwell, L.L.; Cline, J.F.; Gano, K.A.; Warren, J.L.; Rogers, L.E. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Studies performed for the Rockwell Hanford Operations (RHO) were designed to either identify the role of biota in the uptake and transport of radionuclides from low-level waste management areas or design and/or evaluate methods for reducing biological transport of radionuclides away from waste management areas.

15371 **(PNL—3720) Materials characterization center workshop on corrosion of engineered barriers.** Merz, M.D.; Zima, G.E.; Jones, R.H.; Westerman, R.E. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Mar 1981. Contract AC06-76RL01830. 72p. NTIS, PC A04/MF A01.

A workshop on corrosion test procedures for materials to be used as barriers in nuclear waste repositories was conducted August 19 and 20, 1980, at the Battelle Seattle Research Center. The purpose of the meeting was to obtain guidance for the Materials Characterization Center in preparing test procedures to be approved by the Materials Review Board. The workshop identified test procedures that address failure modes of uniform corrosion, pitting and crevice corrosion, stress corrosion, and hydrogen effects that can cause delayed failures. The principal areas that will require further

consideration beyond current engineering practices involve the analyses of pitting, crevice corrosion, and stress corrosion, especially with respect to quantitative predictions of the lifetime of barriers. Special techniques involving accelerated corrosion testing for uniform attack will require development.

15372 **(RHO-BWI-C—85) Thermal/mechanical properties of Pomona member basalt: full-scale heater test No. 2 (area 2).** (Foundation Sciences, Inc., Portland, OR (USA)). Nov 1980. Contract AC06-77RL01030. 154p. NTIS, PC A08/MF A01.

Over 130 specimens from 21 Area 2 (Full-Scale Heater Test No. 2) boreholes were prepared. All samples were from the entablature of the Pomona flow. Pomona basalt from the entablature is hard, dark gray, and closely jointed (0.5 to 1.0 ft columns). It has a moderate porphyritic texture and is primarily composed of plagioclase and augite in a glass groundmass. Most joints and vesicles are lined with chlorophaeite or similar mineraloids. In this study, specimens which contained visible throughgoing fractures are termed jointed; specimens which contained many randomly oriented, hairline cracks were termed multifractured. Specimens with no visible cracks were termed intact or unjointed. Fourteen different thermal and mechanical tests were performed on the various specimens. In general, the thermal and mechanical properties of Area 2 specimens are consistent with the Area 1 results. However, the thermal conductivities for four test specimens were considerably less than the Area 1 thermal conductivity. This may be due to the presence of fractures in these four specimens. The apparent porosity of Area 2 specimens was also less than that of Area 1 specimens. This result can be attributed to the fact that the area to volume ratio was less for the Area 2 specimens than for the Area 1 specimens. Thermal expansion versus temperature data for Area 2 indicated that microcracks may be produced if specimens are heated above 150°C. This result is supported by the observation that the compressive strength of heated specimens is less than the strength of unheated specimens. We recommend that additional work be undertaken to more thoroughly investigate the effects of heating on microcracking.

15373 **(SAND—80-1259) Migration of cesium-137 through a solid core of Magenta dolomite taken from th Rustler Formation in Southeastern New Mexico.** Lynch, A.W.; Dosch, R.G.; Hills, C.R. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 31p. NTIS, PC A03/MF A01.

A column-flow cesium migration experiment has been conducted in support of the safety assessment program for the Waste Isolation Pilot Plant (WIPP) in Southeastern New Mexico. The column was a monolithic cylinder of Magenta dolomite obtained from a core sample drilled near the proposed WIPP site. The fluid was a Magenta equilibrated de-ionized water solution that had been doped with 0.001 ppM of ^{137}Cs. The experiment ran continuously for an 18 month period at flow rates comparable to those measured for natural groundwater at the site. After flowing for 18 months, the apparatus was disassembled and the dolomite column examined for cesium distribution. Cross sectional radiographs of the sample showed that most of the cesium had penetrated only 0.4 cm into the solid Magenta column with a well defined wave front. On the other hand, trace quantities (2×10^{-7} ppM) of ^{137}Cs were detected in effluent samples collected during the experiment. The distribution coefficient (120 ml/gm) calculated (assuming porous flow) from the average depth of cesium penetration (0.3 cm) is considerably less than the value obtained from a batch equilibration measurement made on the same system (650 ml/gm), indicating that cesium will migrate through Magenta rock at a faster rate than batch equilibration value predicts. Transmission electron microscope analysis of a piece of Magenta dolomite from the same core that had been soaked in 1 molar CsCl solution indicated that the cesium was preferentially sorbed on a montmorillonite clay phase that was inhomogeneously dispersed throughout the sample. These results indicate that if groundwater travels through Magenta rock the dissolved cesium may be retarded by the clay content of the rock.

15374 **(SAND—80-2046) Sorption of cesium and strontium from concentrated brines by backfill barrier materials.** Winslow, C.D. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 58p. NTIS, PC A04/MF A01.

The sorption of radionuclides from potentially intruding groundwater at a nuclear waste repository is a major chemical function of backfill barriers. In this study, various materials (including clays, zeolites and an inorganic ion exchanger) were screened for the sorption of the fission products cesium and strontium in concentrated brines. Representative brines A and B for the Waste Isolation Pilot Plant (WIPP), a proposed radioactive waste repository and test facility in bedded salt were used. Sorption properties were quantified using empirical distribution coefficients, k/sub d/. Of the materials examined, sodium titanate had the highest k/sub d/ for the sorption of Sr(II) in both brine A (k/sub d/ = 125 ml/g) and brine B(k/sub d/ = 500 to 600 ml/g). A mordenite-type zeolite was the most effective getter for Cs(I) in brine A (k/sub d = 27 ml/g), while illite yielded the highest k/sub d/ for Cs(I) in brine B (k/sub d/ = 115 ml/g). The relative merit of these k/sub d/ values is evaluated in terms of calculated estimates of breakthrough times for a backfill barrier containing the getter. Results show that a backfill mixture containing these getters is potentially an effective barrier to the migration of Sr(II) and Cs(I), although further study (especially for the sorption of cesium from brine A) is recommended. Initial mechanistic studies revealed competing ion effects which would support an ion exchange mechanism. K/sub d/'s were constant over a Sr(II) concentration range of 10^{-11} to 10^{-5} M and a Cs(I) concentration range of 10^{-9} to 10^{-5} M, supporting the choice of a linear sorption isotherm as a model for the results. Constant batch composition was shown to be attained within one week.

15375 **(SAND—80-2603) Report on the development of equipment and techniques for drilling and machining bedded salt.** Sumlin, H.A. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. 75p. NTIS, PC A04/MF A01.

Equipment and techniques are being developed in the evaluation of bedded salt as a storage media for nuclear waste. Beginning with the Conceptual Design Report for the Waste Isolation Pilot Plant and continuing with field and laboratory experiments indicate the need for a more complete understanding of bedded salt as an engineering material. This report discusses various aspects of bedded salt in its comparison to other materials, machining methods in the laboratory and equipment development to support experiments in mines.

15376 **Process for recovery of palladium from nuclear fuel reprocessing wastes.** Campbell, D.O.; Buxton, S.R. (to Dept. of Energy). US Patent Application 159,892. 16 Jun 1980. 15p.

Palladium is selectively removed from spent nuclear fuel reprocessing waste by adding sugar to a strong nitric acid solution of the waste to partially denitrate the solution and cause formation of an insoluble palladium compound. The process includes the steps of: (a) adjusting the nitric acid content of the starting solution to about 10 M; (b) adding 50% sucrose solution in an amount sufficient to effect the precipitation of the palladium compound; (c) heating the solution at reflux temperature until precipitation is complete; and (d) centrifuging the solution to separate the precipitated palladium compound from the supernatant liquid.

15377 **Backfill composition for secondary barriers in nuclear waste repositories.** Beall, G.W.; Allard, B.M. (to Dept. of Energy). US Patent Application 154,639. 30 May 1980. 19p.

A backfill composition for sorbing and retaining hazardous elements of nuclear wastes comprises 50 to 70% by weight of quartz, 10 to 30% by weight of montmorillonite, 1 to 10% by weight of phosphate mineral, 1 to 10% by weight of ferrous mineral, 1 to 10% by weight of sulfate mineral and 1 to 10% by weight of attapulgite.

15378 **Canister arrangement for storing radioactive waste.** Lorenzo, D.K.; Van Cleve, J.E. Jr. (to Dept. of Energy). US Patent Application 143,060. 23 Apr 1980. 11p.

The subject invention relates to a canister arrangement for jointly storing high level radioactive chemical waste and metallic

waste resulting from the reprocessing of nuclear reactor fuel elements. A cylindrical steel canister is provided with an elongated centrally disposed billet of the metallic waste and the chemical waste in vitreous form is disposed in the annulus surrounding the billet.

15379 **Radioactive waste management and disposal.** Simon, R.; Orlowski, S. (eds.). New York, NY; Harwood Academic Publishers (1980). 694p. (EUR—6871; CONF-8005143—).

From 1. European community conference; Luxembourg, Luxembourg (20 May 1980).

Includes Book of Abstracts.

The first European Community conference on Radioactive Waste Management and Disposal was held in Luxembourg, where twenty-five papers were presented by scientists involved in European Community contract studies and by members of the Commission's scientific staff. The following topics were covered: treatment and conditioning technology of solid intermediate level wastes, alpha-contaminated combustible wastes, gaseous wastes, hulls and dissolver residues and plutonium recovery; waste product evaluation which involves testing of solidified high level wastes and other waste products; engineering storage of vitrified high level wastes and gas storage; and geological disposal in salt, granite and clay formations which includes site characterization, conceptual repository design, waste/formation interactions, migration of radionuclides, safety analysis, mathematical modelling and risk assessment.

15380 **Lead encapsulation of nuclear waste: a risk assessment.** Cohen, J.J.; Coles, D.G.; Ramspott, L.D. (Univ. of California, Livermore). *Transactions of the American Nuclear Society ;* **34**: 350-351(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15381 **DOE program for development of low-level waste disposal technology.** Fitts, R.B.; Lowrie, R.S. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society ;* **34**: 361(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15382 **Carbon-14 removal and fixation from off-gas streams at nuclear facilities.** Haag, G.L. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society ;* **34**: 394-395(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15383 **Removal of radionuclides from Hanford defense waste solutions.** Schultz, W.W. (Rockwell Hanford Operations, Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 395-396(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15384 **Melting mixed-metal scrap reduces volume and contamination level.** Copeland, G.L. (Oak Ridge National Lab., TN); Heestand, R.L.; Mateer, R.S. *Transactions of the American Nuclear Society ;* **34**: 396-397(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15385 **Characteristics of some transuranium-contaminated solid wastes.** Bryan, G.H.; Palmer, C.R. (Battelle Northwest Labs., Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 397-398(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15386 **Development of a remote lab-scale waste treatment facility.** Knox, C.A.; Hanson, M.S. (Battelle Pacific Northwest Labs., Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 398-400(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15387 **Comparative techniques for nuclear fuel cycle waste management systems.** Pelto, P.J.; Voss, J.W. (Battelle Pacific Northwest Labs., Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 402-403(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15388 **Procedures, barriers, state variables, and processes important to near-field analysis.** Feinstein, J.G. (NUS Corp., Rockville, MD); Naft, B.N.; Nieto, J.M.; McIntosh, W.H. *Transactions of the American Nuclear Society ;* **34**: 403-404(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15389 **^{85}Kr management trade-offs: radiological consequences.** Mellinger, P.J.; Hoenes, G.R.; Brackenbush, L.W.; Greenborg, J. (Battelle Pacific Northwest Labs., Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 407-408(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15390 **Actinide partitioning process for fuel cycle wastes.** Finney, B.C.; Tedder, D.W. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society ;* **34**: 412-413(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15391 **Transmutation and fuel cycle impacts.** Croff, A.G.; Alexander, C.W.; Wachter, J.W. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society ;* **34**: 413-414(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15392 **Decommissioning a uranium fuel production plant.** Elder, H.K.; Blahnik, D.E. (Battelle Pacific Northwest Labs., Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 430-432(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15393 **Technology status of spray calcination/vitrification of high-level liquid waste for full-scale application.** Keely, R.B.; Bonner, W.F.; Larson, D.E. *AIChE Symposium Series ;* **75**: No. 191, 50-55(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

Spray calcination and vitrification technology for stabilization of high-level nuclear wastes has been developed to the point that initiation of technology transfer to an industrial-sized facility could begin. This report discusses current process and equipment development status together with additional RandD studies and engineering evaluations needed. Preliminary full-scale process and equipment descriptions are presented. Technology application in a full-scale plant would blend three distinct maintenance design philosophies, depending on service life anticipated: (1) totally remote maintenance with limited viewing and handling equipment, (2) totally remote maintenance with extensive viewing and handling equipment, and (3) contact maintenance.

15394 **Ruthenium containment during fluidized bed calcination of commercial high-level waste.** Rhodes, D.W.; Freeby, W.A.; Christian, J.D. *AIChE Symposium Series ;* **75**: No. 191, 69-75(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

Reprocessing spent nuclear fuel from commercial power reactors to recover plutonium and unburned uranium produces a

highly radioactive first-cycle extraction waste. This high-level liquid waste will contain significant concentrations of /sup 106/Ru; approximately 1.9*10/sup 6/ Ci of /sup 106/Ru will be in the waste processed daily in a 7.5-M.T.U./day plant based on fuel irradiated to 35,000 MWd/M.T.U. and cooled one year after discharge from the reactor (MWd/MTU?Megawatt days/metric ton uranium). During the solidification of the nitric acid waste solution containing the fission products, volatile and particulate ruthenium enters the off-gas stream and must be removed before the off-gas is released to the atmosphere. Laboratory measurements of ruthenium volatility using a 3-in.-diameter fluidized bed calciner and synthetic commercial reprocessing waste are reported. The results indicate that, by operating at 500/degree/C with in-bed combustion heating, one can limit the ruthenium volatility to 2*10/sup -3/% of that in the feed. 28 refs.

15395 Nuclear engineering questions: power, reprocessing, waste, decontamination, fusion. Walton, R.D. Jr. (Ed.). (DOE, Nucl Eng Div, Washington, DC). *AIChE Symposium Series ;* **75**: No. 191, vp(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

This conference proceedings contains 34 papers. 26 papers are indexed separately. Topics covered include: nuclear power; commercial reprocessing; long-term management of commercial high-level waste; long-term management of defense high-level waste; decontamination and decommissioning of nuclear facilities; and, engineering aspects of laser fusion.

15396 Introductory comments on US commercial high-level waste management R and D programs. Cooley, C.R. (US DOE, Washington, DC). *AIChE Symposium Series ;* **75**: No. 191, 47-49(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

A brief overview of U.S. research and development programs on commercial waste management is presented. The basic goal is to provide the technology by 1985 for management of waste from commercial fuel cycles. This includes testing of processes in a radioactive pilot plant, starting passive retrievable storage of spent fuel, and starting a demonstration of geologic isolation. 1 ref.

15397 Long-term management of defense high-level radioactive waste--plans, policies, and programs. Walton, R.D. Jr. (US DOE, Washington, DC). *AIChE Symposium Series ;* **75**: No. 191, 88-92(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

ERDA plans, policies, and programs for long-term management of high-level radioactive waste generated in national defense programs are summarized. Conclusions include that high-level radioactive waste can be placed in safe, cost-effective, long-term management modes which have little dependence upon man's surveillance. Between the writing and the presentation of this paper ERDA responsibilities for long-term management of defense high-level waste were transferred to the new U.S. Department of Energy (DOE). At this time, DOE is evaluating its waste management policy. No major change in the substance of this paper is expected to result from that evaluation. 8 refs.

15398 Long-term management of high-level defense wastes at the Idaho Chemical Processing Plant. Dickey, B.R. (Allied Chem Corp, Idaho Falls, Idaho). *AIChE Symposium Series ;* **75**: No. 191, 93-99(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

Plans and technology for the long-term management of existing and future high-level defense wastes generated at the Idaho Chemical Processing Plant are discussed. Current high-level waste management is also reviewed to show the continuity between present and future high-level waste management. 1 ref.

15399 Vitrification of high-level waste in a joule-heated ceramic melter. Chapman, C.C.; Buelt, J.L. *AIChE Symposium Series ;* **75**: No. 191, 56-60(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

This report describes two radioactive waste vitrification processes. The first is a ceramic melter coupled to a calciner. Pilot-scale testing of a melter is described. The design features and test results developed with this unit are used to define the scale-up requirements needed to support a 1,500-MT-per-year reprocessing plant. The second vitrification process described is the direct liquid-fed ceramic melter. In this process, the high-level liquid waste is slurried with the glass formers and fed directly to the melter. Experimental results with a pilot-scale unit and a large-scale developmental unit are presented. From the testing of these melters, a single-step vitrification process is suggested which would support a reference plant. 5 refs.

15400 High-level radioactive waste glass and storage canister design. Slate, S.C.; Ross, W.A. *AIChE Symposium Series ;* **75**: No. 191, 61-68(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

Management of high-level radioactive wastes is a primary concern in nuclear operations today. The main objective in managing these wastes is to convert them into a solid, durable form which is then isolated from man. A description is given of the design and evaluation of this waste form. The waste form has two main components: the solidified waste and the storage canister. The solid waste form discussed in this study is glass. Waste glasses have been designed to be inert to water attack, physically rugged, low in volatility, and stable over time. Two glass-making processes are under development at PNL. The storage canister is being designed to provide high-integrity containment for solidified wastes from processing to terminal storage. An outline is given of the steps in canister design: material selection, stress and thermal analyses, quality verification, and postfill processing. Examples are given of results obtained from actual nonradioactive demonstration tests. 14 refs.

15401 Salvage of plutonium-and americium-contaminated metals. Gerding, T.J.; Seitz, M.G.; Steindler, M.J. *AIChE Symposium Series ;* **75**: No. 191, 118-127(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

Melt-slagging techniques were evaluated as a decontamination and consolidation step for metals contaminated with oxides of plutonium and americium. Experiments were performed in which mild steel, stainless steel, and nickel metals contaminated with oxides of plutonium and americium were melted in the presence of silicate slags of various compositions. The metal products were low in contamination, with the plutonium and americium strongly fractionated to the slags. Partition coefficients (plutonium in slag/plutonium in steel) of 7*10/sup 6/ with borosilicate slag and 3*10/sup 6/ for calcium, magnesium silicate slag were measured. Decontamination of metals containing as much as 14,000 p.p.m. plutonium appears to be as efficient as that of metals with plutonium levels of 400 p.p.m. Staged extraction, that is, a remelting of processed metal with clean slag, results in further decontamination of the metal. 10 refs.

15402 Planning for decommissioning and decontamination of Hanford Nuclear Facilities. Litchfield, J.W.; King, J.C. *AIChE Symposium Series ;* **75**: No. 191, 151-162(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

The 570-square mile Hanford Project contains facilities with varying degrees of radioactive contamination as a result of plutonium production operations. With the evolution of production requirements and technology, many of these have been retired and will be decommissioned and decontaminated (DandD). Planning for DandD at Hanford requires identification and characterization of contaminated facilities, prioritization of facilities for decommissioning, selection of DandD modes, estimating costs and other characteristics of DandD activities, definition of future scenarios at Hanford, and preparation and assessment of plans to achieve defined scenarios. A multi-attribute decision model using four criteria was used to prioritize facilities for decommissioning. A computer-based interactive planning system was developed to facilitate preparation and assessment of DandD plans.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 15366, 15373, 15374, 15389

15403 (PNL—3700(Pt.2), pp 75-78) **Radioecology of nuclear fuel cycles.** Schreckhise, R.G.; Cadwell, L.L.; Emery, R.M. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

This study provides information to help assess the environmental impacts and certain potential human hazards associated with nuclear fuel cycles. A data base is being developed to define and quantify biological transport routes which will permit credible predictions and assessment of routine and potential large-scale releases of radionuclides and other toxic materials. Information obtained from existing storage and disposal sites will provide a meaningful radioecological perspective with which to improve the effectiveness of waste management practices. This paper focuses on terrestrial and aquatic radioecology of waste management areas and biotic transport parameters.

15404 (PNL—3700(Pt.2), pp 121) **Regional issues identification and assessment.** Warner, M.L.; McShane, M.C. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The Pacific Northwest Laboratory is responsible for a large, diverse region comprised of the states of Alaska, Idaho, Oregon, and Washington. As a part of the Laboratory's team, ecological scientists addressed potential issues and impacts in land use and ecology. The most likely impacts identified were associated with hydroelectric or nuclear power generation, or with oil transportation through the postulated Northern Tier Pipeline.

15405 **(SAND—80-1595) Solubility and sorption characteristics of uranium(VI) associated with rock samples and brines/groundwaters from WIPP and NTS.** Dosch, R.G. (Sandia National Labs., Albuquerque, NM (USA)). Jan 1981. Contract AC04-76DP00789. 38p. NTIS, PC A03/MF A01.

Solubility measurements for U(VI) in WIPP-related brines/groundwaters were made using initial U(VI) concentrations in the range of 1 to 50 μg/ml. Distribution coefficients (Kd) for U(VI) were determined for Culebra and Magenta dolomites using four different brine/groundwater compositions and for argillaceous shale and hornfels samples from the Eleana and Calico Hills Formation on NTS using a groundwater simulant typical of that area. The Kd's were evaluated as functions of: (1) U(VI) concentration (1.4 x 10^{-4} to 1.4 μg/ml); (2) solution volume-to-rock mass ratios used in the measurements (5 to 100 ml/g), and for WIPP material only; (3) water composition (0 to 100% brine in groundwater); and (4) sample location in the Culebra and Magenta dolomite members of the Rustler Formation. The results indicate that if groundwater intrudes into a repository and leaches a waste form, significant concentrations of dissolved or colloidal U(VI) could be maintained in the liquid phase. Should these solutions enter an aquifer system, there are reasonable sets of conditions which could lead to subsequent migration of U(VI) away from the repository site.

0540 Health And Safety

REFER ALSO TO CITATION(S) 15361, 15362, 15373, 15392

15406 **(ORNL—5710) Directory of parameters used in a series of assessment applications of the AIRDOS-EPA and DARTAB computer codes.** Baes, C.F. III; Sharp, R.D. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 88p. NTIS, PC A05/MF A01.

Between January and September 1980, the Oak Ridge National Laboratory (ORNL) performed a series of radiological dose and risk assessments for the US Environmental Protection Agency (EPA) of 79 facilities in the United States which release radionuclides to the atmosphere on a routine basis. The AIRDOS-EPA computer code was used to simulate atmospheric and terrestrial transport and to calculate resulting environmental exposures of individuals and populations to contaminated ground surfaces, air, meat, milk, and vegetables. Doses and risks from these exposures were calculated separately in the computer code DARTAB using dose and risk factors developed through the RADRISK AND INREM II computer codes. Because of the importance of these assessments in determining EPA actions concerning these facilities and the possibility of conflict of interest (ORNL was one of the facilities assessed), Teknekron Research, Inc., was given responsibility for providing site-specific information, including facility code name, location, surrounding population, meteorological information, etc. The Oak Ridge National Laboratory was given responsibility for supplying nuclide-specific information and for running the assessment codes. This report describes and lists the nuclide-specific parameters supplied by ORNL, and for reader convenience, some of the site-specific parameters used in running the codes.

15407 **Overall assessment of actinide partitioning and transmutation.** Blomeke, J.O.; Croff, A.G. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society ;* **34**: 417-420(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15408 **Safety and environmental controls in nuclear fuel reprocessing.** Black, D.E.; Rich, B.L.; Struhs, R.T. *AIChE Symposium Series ;* **75**: No. 191, 19-26(1979). (CONF-771102—).

From 70. annual AICHE meeting; New York, NY, USA (13 Nov 1977).

A summary is presented of radioactive and nonradioactive waste effluent controls, reduction of radiation hazards to personnel, respiratory protection, energy conservation, and measurement of the fissile material content of incoming spent nuclear fuel prior to reprocessing, based on experience at the Idaho Chemical Processing Plant (ICPP).

0550 Regulations

REFER ALSO TO CITATION(S) 15678

15409 **(AGNS—35900-CONF-12) Automated on-line plutonium concentration monitor for process control and safeguards.** Rebagay, T.V.; Huff, G.A.; Hofstetter, K.J. (Allied-General Nuclear Services, Barnwell, SC (USA)). 12 Mar 1981. Contract AC09-78ET35900. 24p. (CONF-810329—1). NTIS, PC A02/MF A01.

From Pittsburgh conference of analytical chemistry and applied spectroscopy; Atlantic City, NJ, USA (9 Mar 1981).

A near real-time inventory can be achieved using the monitor. Since the stream being monitored is the aqueous effluent of the electropulse column, the plutonium profile of this column for a given flowsheet condition could be evaluated. Changes in process parameters that influence the kinetics and efficiency of the purification cycle can be performed in real time. This characteristic of the monitor is very valuable in process control and verification of plutonium inventory. The technique of assaying the plutonium content of the stream sequentially enhances rapid optimization of the flowsheet and also improves timeliness of detection in the event of an attempt to divert the plutonium or in case of column upsets.

15410 **(AGNS—35900-CONF-121) Automated system for controlling authorization, identification, and entry into nuclear facilities.** Barnes, L.D. (Allied-General Nuclear Services, Barnwell, SC (USA)). Jan 1981. Contract AC09-78ET35900. 10p. (CONF-810514—1). NTIS, PC A02/MF A01.

From Carnahan conference on crime counter measures; Lexington, KY, USA (13 May 1981).

An automated access control system developed at the Barnwell Nuclear Fuel Plant is described. This system enables the facility management to control who has access to sensitive areas at specific times, control the authority to grant access to individuals with cross-checks and verification, and provide positive identification of personnel obtaining entry, as well as an auditable record of all

entry events. The individual seeking access enters his memorized identification number into a key pad in the entry booth. Positive verification of the identity claimed is obtained by a voice verification system which compares the sample response obtained at the time of entry with the individual's voice print reference file. The identified user is then issued a temporary proximity card key which will activate the door entry controls into authorized areas. The computerized system provides real-time entry inventory of personnel and controls individual area and personnel authorizations on a need-to-enter basis. The system was installed in 1979 and has been operated on a developmental basis since that time. The system controls access to an industrial area which has a total of fourteen separate and individually controlled subareas containing a combined total of twenty-four doors. Approximately five-hundred people are currently enrolled and using the system. Extended tests requiring 100% participation by employees are currently in progress.

15411 **(LA-UR—81-358) Portable neutron measurement technique for the assay of ^{235}U in LWR fuel assemblies.** Menlove, H.O.; Krick, M.S. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810513—1). NTIS, PC A02/MF A01.

From 4. international conference on nondestructive evaluation in the industry; Lindau, F.R. Germany (May 1981).

An active neutron interrogation technique has been developed for the measurement of the ^{235}U content in fresh fuel assemblies. The method employs an AmLi neutron source to induce fission reactions in the fuel assembly and coincidence counting of the resulting fission reaction neutrons. When no interrogation source is present, the passive neutron coincidence rate gives a measure of the ^{238}U via the spontaneous fission reactions. The system can be applied to the fissile content determination in HWR, BWR, and LWR fuel assemblies for accountability, criticality control, and safeguards purposes.

15412 **(NUREG/CR—1381) Methodology for evaluating safeguards capabilities for licensed nuclear facilities. Final report.** Bennett, H.A.; Olascoaga, M.T.; Sicherman, A.; Smith, G. (Sandia Labs., Albuquerque, NM (USA)). May 1980. 177p. (SAND—80-7028). NTIS, PC A09/MF A01.

This report describes work performed in the development and implementation of an evaluation methodolgy. This methodology was developed to aid the NRC in its evaluation of fixed-site physical protection system performance relative to the Physical Protection Upgrade Rule, 10 CFR Part 73.45.

15413 **(SAND—77-1936(Rev.)(2-81)) Nuclear material operations manual.** Tyler, R.P. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 536p. NTIS, PC A23/MF A01.

This manual provides a concise and comprehensive documentation of the operating procedures currently practiced at Sandia National Laboratories with regard to the management, control, and accountability of nuclear materials. The manual is divided into chapters which are devoted to the separate functions performed in nuclear material operations-management, control, accountability, and safeguards, and the final two chapters comprise a document which is also issued separately to provide a summary of the information and operating procedures relevant to custodians and users of radioactive and nuclear materials. The manual also contains samples of the forms utilized in carrying out nuclear material activities. To enhance the clarity of presentation, operating procedures are presented in the form of playscripts in which the responsible organizations and necessary actions are clearly delineated in a chronological fashion from the initiation of a transaction to its completion.

15414 **(SAND—80-2569C) Plant design and nuclear power plant protection.** Ericson, D.M. Jr.; Varnado, G.B. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. (CONF-810502—1). NTIS, PC A02/MF A01.

From 3. symposium on safeguards and nuclear material management; Karlsruhe, F.R. Germany (6 May 1981).

Beginning with a modern design for a nuclear power plant, the study examines the enhancement of protection which may be achieved by design changes. The degree of enhancement is examined in terms of potential reduction in the number of vital areas and increased probability of adversary sequence interruption. Impacts considered include operational constraints and increased capital and operating costs. The study concludes that structural design changes alone do not provide significant increases in protection but that such changes may facilitate physical protection.

06 FUSION FUELS

0602 Processing

REFER ALSO TO CITATION(S) 15395

15415 **Method and apparatus for determining diameter and wall thickness of minute hollow spherical shells.** Steinman, D.A. (to Dept. of Energy). US Patent Application 154,638. 30 May 1980. 11p.

Method and apparatus for determining diameter and wall thickness of hollow microspheres or shells wherein terminal velocities of shells traveling in fluid-filled conduits of differing diameters are measured. A wall-effect factor is determined as a ratio of the terminal velocities, and shell outside diameter may then be ascertained as a predetermined empirical function of wall-effect factor. For shells of known outside diameter, wall thickness may then be ascertained as a predetermined empirical function of terminal velocity in either conduit.

15416 **Interferometric characterization of cryogenic targets in a laser-fusion target chamber.** Tarvin, J.A.; Musinski, D.L.; Pattinson, T.R.; Sigler, R.D.; Busch, G.E. (KMS Fusion, Inc., Ann Arbor, MI). *SPIE (Society of Photo-Optical Instrumentation Engineers) Seminar Proceedings ;* **192**: 239-243(1979).

Current cryogenic targets for laser fusion experiments consist of glass microshell pellets with deuterium-tritium fuel frozen inside. The fuel forms a uniform layer in the optimum configuration. Until very sophisticated injection systems are developed, these targets must be prepared in the experimental target chamber. This situation imposes restraints upon any technique used to characterize the quality of the targets before they are irradiated by the high power laser. This paper describes a wavefront-shearing interferometer for characterizing cryogenic targets in situ. The interferometer, which is based on the Saunder's shearing cube, is easy to adjust and is very stable in the presence of mechanical vibration; it produces fringes of high contrast without sacrificing intensity. The interferometer has been used with a low power pulsed laser to measure both the effect of amplified spontaneous emission, produced by the high power laser, and the effect of room-temperature thermal radiation on cryogenic targets.

0603 By-products

15417 **(UCID—18909(Vol.2)) Synfuels from fusion: producing hydrogen with the Tandem Mirror Reactor and thermochemical cycles.** Werner, R.W.; Ribe, F.L. (California Univ., Livermore (USA). Lawrence Livermore National Lab.; Washington Univ., Seattle (USA). Dept. of Nuclear Engineering). 21 Jan 1981. Contract W-7405-ENG-48. 482p. NTIS, PC A21/MF A01.

This volume contains the following sections: (1) the Tandem Mirror fusion driver, (2) the Cauldron blanket module, (3) the flowing microsphere, (4) coupling the reactor to the process, (5) the thermochemical cycles, and (6) chemical reactors and process units. (MOW)

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

15418 **(NEANDC(US)—204/A(12-80)) Stable isotope research pool inventory.** (Oak Ridge National Lab., TN (USA)). Dec 1980. Contract W-7405-ENG-26. 59p. (DOE/NDC—13(12-80); INDC(US)—80/G(12-80)). NTIS, PC A04/MF A01.

This report contains a listing of electromagnetically separated stable isotopes which are available for distribution within the United States for non-destructive research use from the Oak Ridge National Laboratory on a loan basis. This inventory includes all samples of stable isotopes in the Materials Research Collection and does not designate whether a sample is out on loan or in reprocessing.

0702 Radiation Sources

REFER ALSO TO CITATION(S) 15934

15419 **(GEPP-TIS—554) Study of elastomer filler/ceramic delamination in neutron tubes.** Creed, K.E. Jr.; Gillespie, T.J. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 28 Feb 1981. Contract AC04-76DP00656. 55p. NTIS, PC A04/MF A01.

When neutron tubes evidenced electrical breakdowns during final test, these breakdowns were attributed to a delamination formed between the elastomer encapsulant and the ID of the ceramic tube well. Tests were developed to evaluate the tensile strength elongation characteristics of the filler and the adhesion between the encapsulant and ceramic in the product tube well as measures of this delamination tendency. The encapsulant was an Adiprene polyurethane rubber, trimethylolpropane and butanediol system.

08 HYDROGEN

15420 **(DOE/TIC—3358(Supp.1)) Hydrogen fuels: a bibliography.** Kern, L.H. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Feb 1981. 701p. NTIS, PC A99/MF A01.

This bibliography contains 3298 references to current research on hydrogen including production, storage, transport, marketing and economics, safety, industrial and commercial use, properties, and environmental aspects. Corporate, author, subject and report number indexes are provided.

0801 Production

REFER ALSO TO CITATION(S) 15417, 15442

15421 **Consideration of electrodes and electrolytes for electrochemical gasification of coal by anodic oxidation.** Coughlin, R.W.; Farooque, M. (Univ. of Connecticut, Storrs). *Journal of Applied Electrochemistry ;* **10**: No. 6, 729-740(Nov 1980).

It has been found that the performance of graphite anodes in coal electrolysis is closely comparable to that reported previously for anodes of Pt gauze; the sole exception discerned thus far is that the gases formed anodically at graphite are somewhat enriched in carbon monoxide and correspondingly depleted in carbon dioxide as compared to Pt anodes. No significant consumption or degradation of the graphite was observed during short experiments in which about half an equivalent of charge passed - the weight gain measured was about 0.05% of that computed from the assumption of formation of an equivalent quantity of surface oxides. Of several different electrolytes considered and tested, aqueous solutions of H_2SO_4 appear to cause the most rapid reaction rates.

15422 **Perfluorosulphonic acid (Nafion) membrane as a separator for an advanced alkaline water electrolyser.** Yeo, R.S.; McBreen, J.; Kissel, G.; Kulesa, F.; Srinivasan, S. (Brookhaven National Lab., Upton, NY). *Journal of Applied Electrochemistry ;* **10**: No. 6, 741-747(Nov 1980).

Nafion membranes of two different equivalent weights (eq. wt) were evaluated as a separator in an alkaline electrolyser with nickel screen electrodes in both KOH and NaOH electrolytes over the concentration range of 10 to 30 wt % and at temperatures from 25 to 160°C. For the same current densities, the cell voltage with 30% KOH electrolytes was more than twice that with 30% NaOH. This result correlates with the water content of the membrane which is almost twice as high in NaOH electrolytes. Thinner membranes and membranes of lower equivalent weight give lower cell voltages. Materials and performance considerations indicate that a membrane of 1000 eq. wt is the optimum separator for an alkaline electlyzer. Indications are that LiOH may be an even better electrolyte than NaOH for use with Nafion membranes. Further improvements in performance can be expected by membrane pretreatment such as exposing the membrane to elevated temperature in water. Nafion membranes have excellent physical and mechanical properties in alkaline electrolyte and can be used at temperatures up to 250°C.

15423 **Materials problems in production, transport, and storage of hydrogen.** Krikorlan, O.H. (Lawrence Livermore Lab., CA). pp 10.1-10.12 of Materials and corrosion problems in energy systems. Lochmann, W.J.; Indig, M. (eds.). Houston, TX; National Association of Corrosion Engineers (1980).

From Energy-sources technology conference; New Orleans, LA, USA (3 Feb 1980).

Some of the critical materials problems that are anticipated in future hydrogen technologies are discussed here. Advanced technologies for hydrogen production include thermochemical cycles, advanced water electrolysis, and high temperature steam electrolysis. In hydrogen production by thermochemical cycles, materials problems center primarily around an H_2SO_4 boiler, and H_2SO_4 vapor decomposer, and an HI decomposer. Adequate materials are available for these applications, but further development is desirable to reduce fabrication and design problems and extend equipment lifetimes. In advanced electrolytic hydrogen production, the main thrust has been to raise cell efficiencies by raising operating temperatures and pressures using two approaches: (1) an alkaline electrolyte cell, and (2) a solid polymer electrolyte cell. The more extreme conditions in these advanced cells lead to the need for more corrosion resistant separator and electrode materials. Also, in order to maximize operating efficiency, new low-cost electrocatalysts are needed to reduce electrode over-potentials.

15424 **Development of an electrolytic cell for the anodic oxidation of sulphur dioxide and the cathodic production of hydrogen within the sulphuric acid hybrid cycle. Final report.** Struck, B.D.; Junginger, R.; Boltersdorf, D.; Dujka, B.; Neumeister, H.; Triefenbach, D. Luxembourg; Commission of the European Communities (1980). 69p. (EUR—6961-EN).

During the development an electrolytic cell for the electrochemical step of the sulfuric acid hybrid cycle the following significant results have been obtained. A flow through graphite felt anode attained 100 mA/cm² at 370 mV (rev. H_2), 200 mA/cm² at 390 mV (rev. H_2) and 1 A/cm² at 420 mV (rev. H_2). Cathodes on the basis of metal carbides showed already promising but not yet technical results. About 50 separators were studied and species of rather low resistivity were found. Neosepta membranes have a lower resistivity than Nafion membranes and are considerably cheaper. The electrolytic cell was constructed and optimized with respect to geometry, material, electrode type and electrolyte concentration. the voltage of a three compartment electrolytic cell (anode compartment: 50 w/o H_2SO_4 + 0.15 w/o HI, SO_2 (1 bar, sat.), 88°C) was 495 mV at 100 mA/cm², 625 mV at 200 mA/cm², 745 mV at 300 mA/cm² and 860 mV at 400 mA/cm². Cell materials, electrodes and separators remained mechanically stable within a 300-h long time run.

0802 Storage

15425 **(PB—80-811086) Hydrogen storage: storage as a gas or liquid. 1974-May, 1980 (citations from the NTIS Data Base). Report for 1974-May 80.** Cavagnaro, D.M. (Office of the Publication Board, Washington, DC (USA)). Jun 1980. 151p. NTIS PC N01/MF N01.

The bibliography relates to storing hydrogen as a liquid or a gas. Topics include fuel storage, energy storage, and the construction of tanks used to store the material. Any type of storage that is related to batteries, fuel cells, or solar cells are excluded, unless the abstract states that its purpose is to store hydrogen. (This updated bibliography contains 144 abstracts, 18 of which are new entries to the previous edition.)

15426 **(PB—80-811094) Hydrogen storage: hydrogen as a hydride. 1974-May, 1980 (citations from the NTIS Data Base). Report for 1974-May 80.** Cavagnaro, D.M. (Office of the Publication Board, Washington, DC (USA)). Jun 1980. 142p. NTIS PC N01/MF N01.

The bibliography covers hydrogen storage as a hydride. Topics include the chemical and physical properties of the hydride, and how useful it may be for hydrogen storage. Also considered is the conversion of hydrogen to a hydride and the conversion back to hydrogen. (This updated bibliography contains 135 abstracts, 14 of which are new entries to the previous edition.)

0808 Properties

REFER ALSO TO CITATION(S) 15903

15427 **Raman spectroscopic study of a laminar hydrogen diffusion flame in air.** Aeschliman, D.P.; Cummings, J.C.; Hill, R.A. (Sandia Labs., Albuquerque, NM). *Journal of Quantitative Spectroscopy and Radiative Transfer ;* **21**: 293-307(1979).

Spontaneous Raman spectroscopy has been employed for time-averaged, spatially-resolved measurements of temperature and species concentration in an axisymmetric, laminar hydrogen diffusion flame in quiescent air. Temperatures were obtained from vibrational Q-branch Raman spectra of N_2, O_2, and H_2 and the rotational Raman spectra of N_2 and H_2, and concentrations of H_2, O_2, and N_2 were determined. The results are compared to existing numerical nonequilibrium calculations for the conditions of this experiment. Significant differences between experimental and predicted temperature and concentration profiles were observed. In particular, the flame is larger in both diameter and length and the flame zone is thicker than predicted. Some possible sources of the discrepancies are discussed.

09 OTHER SYNTHETIC AND NATURAL FUELS

REFER ALSO TO CITATION(S) 15749

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 15186, 15197, 15200, 15468, 15469, 15470, 15891

15428 **(BM-RI—8487) Effects of additives on methanation activity of Raney nickel catalysts.** Russell, J.H.; Oden, L.L.; Henry, J.L. (Bureau of Mines, Albany, OR (USA). Albany Research Center). 1980. 25p. NTIS, PC A02/MF A01.

The Bureau of Mines, US Department of the Interior, in cooperation with the Department of Energy, has attempted to increase the activity of nickel catalysts for converting synthesis gas, derived from coal, to a substitute natural gas. This report describes the effects of low-level additions of B, Ca, Ce, Co, Mn, Mo, Pd, Re, Ti, Y, Zn, and Zr on the methanation activity of Raney nickel. The methanation rate of 320°C and the resistance to poisoning by 2 ppM H_2S were used to compare catalysts. The effects of the additions were small, and the experimental variances were large, necessitating the use of statistical methods to identify significant effects. Co, Ti, Y, and Zn improved the resistance to H_2S poisoning, but only Co improved the methanation rate. In some individual catalysts containing Ca, Mo, or Mn, both the methanation rate and resistance to H_2S poisoning were improved.

15429 **(DOE/PC/30304—1) Soot formation in synfuels. First quarterly report, 19 September-31 December 1980.** Olson, D.B. (AeroChem Research Labs., Inc., Princeton, NJ (USA)). Mar 1981. Contract AC22-80PC30304. 23p. (AeroChem-TN—218). NTIS, PC A02/MF A01.

An experimental program is underway to study the effects of molecular structure, pressure, and temperature on soot production in laboratory flames of selected synfuel component hydrocarbons. This is being performed in two tasks. The objective of Task I is to formulate an empirical relationship between fuel molecular structure and soot threshold and soot yield behavior. Such a predictive relationship will allow a fuel mixture's sooting performance to be calculated from knowledge about the mixture components. The objective of Task II is an understanding of the chemistry by which fuel molecules and fragments grow larger and finally become soot particles. This will be accomplished using mass spectrometric measurement of heavy neutral and ionic species concentration profiles in high pressure flames of n-decane and p-cymene, and in flames of fuel mixtures. Task I efforts this quarter have been to build a premixed flame burner and a fuel vaporizer and metering system, and to develop an optical soot temperature and soot volume fraction measurement instrument. Task II efforts have been to design and test three sampling cone types, operation of the two stage quadrupole mass spectrometer sampling from 1 atm flames, and design of high pressure (5 to 10 atm) burners and mass spectrometer modifications.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 15468

15430 **Method and system for ethanol production.** Feder, H.M.; Chen, M.J. (to Dept. of Energy). US Patent Application 151,996. 21 May 1980. 27p.

A transition metal carbonyl and a tertiary amine are employed as a homogeneous catalytic system in methanol or a less volatile solvent to react methanol with carbon monoxide and hydrogen gas producing ethanol and carbon dioxide. The gas contains a high carbon monoxide to hydrogen ratio as is present in a typical gasifier product. The reaction has potential for anhydrous ethanol production as carbon dioxide rather than water is produced. The only other significant by-product is methane. Selected transition metal carbonyls include those of iron, ruthenium and possibly manganese and osmium. Selected amines include trimethylamine, N-Methylpyrrolidine, 24-diazabicyclooctane, dimethyneopentylamine and 2-pryidinol.

0903 Inorganic Hydrogen Compound Fuels

REFER ALSO TO CITATION(S) 15903

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 15791

15431 **Generating steam from refuse.** Pollock, W.H. (Combustion Engineering, Inc., Windsor, CT). pp 15p, Section 15, Paper 1 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

The steam generated from a refuse-fired boiler can be low pressure/saturated for uses such as district heating or higher pressure/superheated for use in a turbine generator set to produce electrical power. Only the boiler design in the refuse-fired steam plant is discussed. Three distinctly separate methods of burning refuse for steam generation described are: suspension firing of prepared refuse, spreader stoker firing of prepared refuse, and mass burning of unprepared refuse.

13 HYDRO ENERGY

15432 **(JHU/APL-EQR—80-1) Energy programs. Quarterly report, January-March 1980.** (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). 1980. Contract AS02-76EV03277. 53p. NTIS, PC A04/MF A01.

The Johns Hopkins University Applied Physics Laboratory, is engaged in developing energy resource, utilization concepts, and monitoring and storage methods. This Quarterly Report summa-

rizes the work on the various tasks as of 31 March 1980. The Energy Quarterly Report is divided into four sections. The first, Geothermal Energy Development Planning and Technical Assistance, contains reports on the progress of geothermal-related tasks on which effort was concentrated during the quarter. The second section, Operational Research, Hydroelectric Power Development, contains reports on small-scale hydroelectric investigations in the southeastern states. The third section, Seismotectonic Investigation, reports on a neotectonic investigation in Connecticut. The fourth section, Energy Conversion and Storage Techniques, contains two articles, the first on OTEC core unit testing supported by the Department of Energy/Division of Central Solar Technology (DOE/CST), and the second on an analysis of the Community Annual Storage Energy System at the US Naval Air Station, Norfolk, Va.

1301 Resources And Availability

15433 **Small-Scale Hydroelectric Demonstration Program.** Gilmore, C.E.; Smith, G.L. (US DOE, Idaho Falls, Idaho). pp 53-66 of Hydropower: a national energy resource. New York, NY; Engineering Foundation (1979).

From Hydropower: a national energy resource workshop; Easton, MD, USA (11 Mar 1979).

The objective of the Department of Energy's Small-Scale Hydroelectric program is to provide an option to the nation for greatly increasing the use of hydroelectric energy through the identification and development of the nation's substantial small-scale hydro resources. The strategy is to promote rapid near term growth by accelerating utilization of the most readily accessible hydro resource, existing dams, with active commercial participation. To date, two major incentive programs have been conducted utilizing government financial participation in 54 hydroelectric feasibility assessments and 7 hydroelectric demonstration projects.

1303 Plant Design And Operation

15434 **Hydropower: transmission and interties.** Harman, R.E. (DOE, Golden, Colo). pp 266-275 of Hydropower: a national energy resource. New York, NY; Engineering Foundation (1979).

From Hydropower: a national energy resource workshop; Easton, MD, USA (11 Mar 1979).

Several broad aspects of the subject of transmission and interties are discussed by looking at the development of transmission facilities and system interties; the operation of interconnected power systems; the role of hydropower in power system operations; the role of the Federal Government in electric power generation, transmission, and marketing; and, more specifically, the role of the Western Area Power Administration.

1304 Regulations And Licensing

15435 **Legal and institutional issues: a regulatory agency's view.** Corso, R.A. (Fed Energy Regul Comm, Washington, DC). pp 276-283 of Hydropower: a national energy resource. New York, NY; Engineering Foundation (1979).

From Hydropower: a national energy resource workshop; Easton, MD, USA (11 Mar 1979).

A brief background of the Federal Energy Regulatory Commission's involvement in hydro development is given. Regulatory issues associated with non-Federal hydro development are discussed having the goal to make the path to a license for hydro development more direct and simplified without comprising the intent of the Federal Power Act and other statutes.

1306 Environmental Aspects

REFER ALSO TO CITATION(S) 15404, 16115, 16116

15436 **Potential environmental impacts of hydroelectric development: an overview.** Hildebrand, S.G. (Oak Ridge Natl Lab, Tenn). pp 291-321 of Hydropower: a national energy resource. New York, NY; Engineering Foundation (1979).

From Hydropower: a national energy resource workshop; Easton, MD, USA (11 Mar 1979).

General classes of environmental impact related to hydropower development are briefly explained. The complexity of competing water and land use issues that can affect hydropower development projects is shown.

1307 Power Conversion Systems

15437 **Coriolis Program--a review of the status of the ocean turbine energy system.** Lissaman, P.B.S.; Radkey, R.L. (AeroVironment Inc, Pasadena, Calif). pp 559-565 of Oceans conference. Piscataway, NJ; IEEE (1979).

From MTS Oceans conference; San Diego, CA, USA (Sep 1979).

The goal of the Coriolis Program is to develop an energy system to generate electrical power via an array of large ducted turbines moored about 30 km east of Miami in the Florida Current of the Gulf Stream. Numerous studies have been made of the technical, economic, and environmental issues involved. The program background is given, and the system as currently envisaged is described. Important environmental issues are reviewed and estimates of effects are given which show that the program will have no adverse local or global effects. In this work, theoretical and experimental studies show that the catenary turbine rotors will be free of adverse vibrations, and that the proposed mooring system will be stable and well damped. Finally, the overall Coriolis Program plan is reviewed and the next phases for the design and construction of a small scale (11 m diameter) prototype are discussed. 12 refs.

14 SOLAR ENERGY

REFER ALSO TO CITATION(S) 15749, 15750

15438 **(TAC-STPG—80-004) Solar power generation: a bibliography with abstracts. Quarterly update, October-December 1980.** (New Mexico Univ., Albuquerque (USA). Technology Application Center). Mar 1981. 232p. Univ. of New Mexico, Albuquerque.

This annotated bibliography covers the following subjects: energy overviews; solar overviews; energy conservation; environmental, health, and safety aspects; economics, law, and policy; total energy, hybrid, and combined systems; solar thermal power; thermoelectric, thermionic, and thermochemical; ocean thermal energy conversion; wind energy; biomass, bioconversion, biochemical, photochemical; and energy storage. (MHR)

1401 Resources And Availability

REFER ALSO TO CITATION(S) 15509, 15583, 15584, 15585, 15586, 15587, 15588, 15589, 15590, 15591, 15592, 15593, 15594

1403 Economics

REFER ALSO TO CITATION(S) 15478, 15479, 15480, 15481, 15496, 15503

1404 Environmental, Legal, And Institutional Aspects

REFER ALSO TO CITATION(S) 15471, 15493

15439 **Solar access law. Protecting access to sunlight for solar energy systems.** Hayes, G.B. Cambridge, MA; Ballinger Publishing Company (1979). 303p.

Legal strategies are evaluated to assure present and future solar energy system owners that they will receive light on their collectors. Protecting solar access in developed urban and suburban areas is stressed. Radically new types of laws, as well as familiar tools such as zoning, are examined as possible protective measures. The pros and cons of various possible approaches are discussed in detail, as are the relevant technical requirements of collectors and the mathematics of sun angles. (MHR)

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 15471, 15472, 15786, 15910

15440 (AD-A—088161) N-type molybdenum diselenide-based photoelectrochemical cells: evidence for Fermi level pinning and comparison of the efficiency for conversion of light to electricity with various solvent/halogen/halide combinations. Interim technical report. Schneemeyer, L.F.; Wrighton, M.S. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemistry). 18 Jul 1980. Contract N00014-78-C-0630. 45p. NTIS, PC A03/MF A01.

Interfacial energetics for n-type $MoSe_2$ (E(g) = 1.4 eV, direct) and photoelectrochemical conversion of light to electrical energy in the presence of X(n)(-)/X(-) (X = Cl, Br, I) have been characterized in CH_3CN electrolyte solution. Data for $MoSe_2$ in $H_2O/I_3(-)/I(-)$ are included for comparison, along with a comparison of $MoSe^*$-based cells with MoS_2- (E(g) = 1.7 eV, direct) based cells. Cyclic voltammetry for a set of reversible (at Pt electrodes) redox couples whose formal potential, E(o), spans a range -0.8 to +1.5 V vs. SCE has been employed to establish the interface energetics of $MoSe_2$. For the redox couples having E(o) more negative than approximately -0.1 V. vs. SCE, we find reversible electrochemistry in the dark at n-type $MoSe_2$. When E (o) is somewhat positive of -0.1 V vs. SCE we find that oxidation of the reduced form of the redox couple can be effected in an uphill sense by irradiation of the n-type $MoSe_2$ with = or > E(g) light; the anodic current peak is at a more negative potential than at Pt for such situations. The extent to which the photoanodic current peak is more negative than at Pt is a measure of the output photovoltage for a given couple. For E(o) more positive than approximately +0.7 V vs. SCE it would appear that this output photovoltage is constant at approximately 0.4 V. For a redox couple such as biferrocene (E(o)(BF(+)/BF = +0.3 V vs. SCE) we find a photoanodic current onset at approximately -0.2 V vs. SCE; a redox couple with E = 1.5 V vs. SCE shows an output photovoltage of 0.43 V under the same conditions.

15441 (AD-A—088532) Luminescent tellurium-doped cadmium sulfide electrodes as probes of semiconductor excited-state deactivation processes in photoelectrochemical cells. Technical report. Ellis, A.B.; Karas, B.R.; Streckert, H.H. (Wisconsin Univ., Madison (USA). Dept. of Chemistry). 12 Aug 1980. Contract N00014-78-C-0633. 30p. NTIS, PC A03/MF A01.

Correlations between quantum efficiencies for photocurrent (phi (x)), emission (phi r), and nonradiative recombination (phi (nr)) are discussed with reference to data from single-crystal, n-type, 100 and 1000 ppm CdS:Te-based photoelectrochemical cells (PECs) employing aqueous sulfide electrolyte. These materials emit while they serve as PEC electrodes. The assumption that the proportionality of phi (r) to phi (nr) is unaffected by potential leads to a simple expression relating phi (x) to phi (r) for monochromatic excitation. Calculated and observed emission data are in reasonable agreement; sources of deviation are discussed. Polychromatic excitation is shown to yield photocurrent and emission intensity which is approximately a weighted average of the values obtained with the constituent monochromatic frequencies. Practical implications of the phi (x) correlation with phi (r) are described, as are related results from other PECs.

15442 (CONF-800793—1) Enhancement of hydrogen photoproduction by marine chromatium sp. Miami PBS 1071 grown in molecular nitrogen. Ohta, Y.; Mitsui, A. (Miami Univ., FL (USA). Rosenstiel School of Marine and Atmospheric Sciences). 1980. Contract AC02-77CH00178. 7p. NTIS, PC A02/MF A01.

From 6. international fermentation symposium and 5. international symposium on yeasts; London, Ontario, Canada (Jul 1980).

The marine Chromatium sp. Miami PSB 1071 was grown on molecular nitrogen as the sole source of nitrogen. These cells exhibited active hydrogen production in the light from hydrogen donor substances such as thiosulfate, sulfide, acetate, fumarate, malate and succinate. Hydrogen was produced as 2 to 3 times higher rates when two donor substances, succinate and thiosulfate (or succinate and sulfide) were used together. Hydrogen production rates as high as 6 μmoles hydrogen/mg protein/hr were observed in cells from the middle of the logarithmic growth phase cells. These rates were 6 to 10 times higher than those of stationary growth phase cells. Hydrogen production was light dependent and hydrogen was consumed in the dark at a slower rate. High rates of hydrogen production were observed at seawater salinities and high light intensities. The response of growth and nitrogen fixation in this strain to environmental regulation suggest that it could be successfully used in saltwater based bio-solar hydrogen production systems.

15443 (COO—3004-4) Thin films of InP for photovoltaic energy conversion. Final report, July 5, 1979-July 4, 1980. Manasevit, H.M.; Ruth, R.P.; Moudy, L.A.; Yang, J.J.; Johnson, R.E. (Rockwell International Corp., Anaheim, CA (USA). Electronic Devices Div.). Aug 1980. Contract AC02-79ET23004. 164p. NTIS, PC A08/MF A01.

Research to develop a low-cost high-efficiency thin-film InP heterojunction solar cell, using the metalorganic chemical vapor deposition (MO-CVD) technique for InP film growth on suitable substrates is reported. Heterostructure devices of CdS/InP, using InP films prepared by CO-CVD, were prepared and characterized. The research effort involved three major technical tasks: (1) materials growth; (2) materials characterization; and (3) device fabrication and characterization. The principal results achieved in the investigations are as follows: (1) temperature-activated orientation-dependent background donor doping was observed in undoped epitaxial InP films; (2) p-type epitaxial InP films were prepared by Zn and by Cd doping during growth; (3) the efficacy of Cd doping was found to vary exponentially with the reciprocal of the deposition temperature in the range 650 to 730°C; (4) Cd doping appeared to offer no clear advantages over Zn doping for preparation of p-type InP by the MO-CVD process; (5) GaP grown by MO-CVD was investigated as a possible intermediate-layer material for growth of InP films on low-cost substrates; (6) p^+ GaAs polycrystalline layers ($p > {}^{19}$ cm^{-3}) were successfully prepared by Zn doping during MO-CVD growth on various low-cost substrates and used as surfaces for growth of p-type polycrystalline InP:Zn layers; (7) nCdS/pInP heterojunction solar cells were prepared by vacuum deposition of CdS onto p-type InP films grown by MO-CVD as well as on InP single-crystal wafers; (8) the best polycrystalline CdS/InP cells were obtained in structures on P^+ GaAs:Zn layers on both Mo sheet and Corning Code 0317 Glass; and (9) structure analyses of the Cds films used in the heterojunction cells indicated the presence of polycrystalline hexagonal CdS even in films grown on single-crystal InP films or bulk-wafer substrates. (WHK)

15444 (DOE/ER/04452—3) Physical and chemical studies of chlorophyll in microemulsions. Progress report. (Drexel Univ., Philadelphia, PA (USA). Dept. of Chemistry). 1980. Contract AS02-77ER04452. 14p. NTIS, PC A02/MF A01.

Studies designed to provide fundamental information on both the nature of photoreactions in microemulsions and the utility of these media as solvents for absorbers of solar energy were conducted. As a test system, the photoreduction of absorbed dye (principally methyl red) sensitized by chlorophyll a in an anionic mineral oil in water microemulsion was investiged. Using ascorbate as the water soluble reducing agent and pigment concentrations of up to eight per drop (10mM), the reaction exhibits a pseudo zero order dependence on methyl red. The effect of sensitizer, ascorbate concentration and light intensity on the quantum yield was examined, as well as the effect of varying the microemulsion charge type, product catalysis, and the use of synthetic porphyrin sensitizers. In microemulsions containing up to eight chlorophyll molecules per microdroplet, the quantum yield remains constant over five orders of magnitude concentration. The intrinsic quantum yield is independent of droplet surface charge, but is dependent on pH. One of the products of the chemical reduction of methyl red, N, N-dimethyl-p-phenylenediamine (DMPD), increases the limiting quantum yield two to three fold. Synthetic porphyrins have been found to act as sensitizers, and a number of tetrapyridyl porphyrin derivatives containing one to four carbon chains of varying length have been made and examined. The results show that the quantum yield increases with increasing chain length for the monoalkyl compounds, and also indicate the possible involvement of a sensitizer orientation effect. The transport of oil soluble electroactive species in nonionic microemulsions has been found to exhibit percolation behavior, which has potential photogalvanic applications.

15445 **(DOE/ER/10632—1) Studies of the photoelectrochemistry of organic dyes using attenuated total reflection techniques.** Spitler, M.T. (Mount Holyoke Coll., South Hadley, MA (USA)). Jan 1981. Contract AC02-80ER10632. 9p. NTIS, PC A02/MF A01.

An experimental apparatus has been assembled for the photoelectrochemical investigation of organic dyestuffs: through the use of attenuated total reflection (ATR) techniques, it is capable of measuring photocurrent, dye absorbance, and fluorescence simultaneously in computer controlled experiments with a time resolution of 200 nsec. Selected semiconductors have been cut and polished to the prismatic shape required of the substrate electrode. The spectral and energetic characteristics of several series of cyanine dyes have been determined; their photoelectrochemical behavior has been studied using standard techniques prior to use in the ATR system. Experimentation with these dyes in the ATR arrangement is now in progress.

15446 **(DOE/ET/23038—4) Black a-Si:H sputtered films for photovoltaic solar cells. Final technical progress report, May 15, 1979-May 15, 1980.** Messier, R.; Tsong, I.S.T. (Pennsylvania State Univ., University Park (USA). Materials Research Labs.). 1980. Contract AC03-79ET23038. 50p. NTIS, PC A03/MF A01.

Aa a first step in attempting to understand the many interrelated deposition processes and film characteristics which govern sputter deposited a-Si:H film quality, a number of important basic film characteristics as a function of the preparation parameters total plasma pressure P/sub T/ and H_2 partial pressure, %H (in Ar), for the range P/sub T/ = 5 to 70mTorr and %H = 0.10, were examined in detail. A series of films were systematically prepared in this region of deposition parameter space, and these films were characterized with respect to surface and internal microstructure, chemical reactivity and etchability, total elemental composition, H-bonding configuration, intrinsic mechanical stress, optical bandgap, and mean density. In general terms, the films are described by a transition of properties dependent upon both P/sub T/ and %H. Films prepared at high P/sub T/ display a distinct columnar morphology with varying extent of intercolumn void or low-density regions. Some of these films have densities as low as ~ 60% that of c-Si, contain H predominantly in the dihydride bonding configuration, and undergo post-deposition oxidation to an extent as great as ~ 10 wt %. Films prepared in the low P/sub T/ regime are without detectable microstructure and chemically stable with no detectable bulk oxidation after many months. In these films, up to 20 at. %H was found almost entirely as monohydride, Ar content was as high as 7 at. %H, and compressive intrinsic stresses were found as large as 5 x 10^9 dynes/cm^2. These results are entirely consistent with the general Structure Zone Model (SZM) of physical vapor deposition upon which there are superimposed the chemical effects of H_2 reactive sputtering. 64 references.

15447 **(DOE/JPL—1012-51) Progress Report 16 for the period April-September 1980, and the proceedings of the 16th Project Integration Meeting.** McDonald, R.R. (Jet Propulsion Lab., Pasadena, CA (USA)). 1980. Contract AI01-76ET20356. 494p. NTIS, PC A21/MF A01.

Progress made by the Low-Cost Solar Array Project during the period April to September 1980, is reported in detail. Progress on project analysis and integration; technology development in silicon material, large-area silicon sheet and encapsulation; production process and equipment development; engineering, and operations is described. A report on, and copies of visual presentations made at, the Project Integration Meeting held September 24 and 25, 1980 are included.

15448 **(DOE/JPL/955055—81/6) Silicon-solar-cell process development, fabrication, and analysis. Final report.** Minahan, J.A.;. (Spectrolab, Inc., Sylmar, CA (USA)). 9 Mar 1981. Contract NAS-7-100-955055. 75p. NTIS, PC A04/MF A01.

Solar cells have been fabricated from unconventional silicon materials in the second and final phase of the contract. In the most recent period of work, EFG, Web, Hem, and Continuous CZ silicon materials were fabricated into solar cells, measured and analyzed. Current-voltage measurements under AM1 conditions, in addition to those under AMO conditions, were introduced in Phase II. Several low-cost fabrication steps were included in that phase. Both Hem and Continuous CZ silicon were found to be superior to what had been provided in Phase I. Correlation between quality of starting materials and cell conversion efficiency was observed for Hem-grown silicon. Correlation between position in the crystal growth sequence and cell quality was observed for Continuous CZ.

15449 **(DOE/JPL/955387—80/4) Anti-reflection coatings applied by acid-leaching process. Final report.** Pastirik, E. (Motorola, Inc., Phoenix, AZ (USA). Semiconductor Group). Sep 1980. Contract NA-7-100-955387. 51p. NTIS, PC A04/MF A01.

The Magicote C process developed by S.M. Thompsen was evaluated for use in applying an antireflective coating to the cover plates of solar cell panels. The process uses a fluosilicic acid solution supersaturated with silica at elevated temperature to selectively attack the surface of soda-lime glass cover plates and alter the physical and chemical composition of a thin layer of glass. The altered glass layer constitutes an antireflective coating. The process produces coatings of excellent optical quality which possess outstanding resistance to soiling and staining. The coatings produced are not resistant to mechanical abrasion and are attacked to some extent by glass cleansers. Control of the filming process was found to be difficult.

15450 **(DOE/JPL/955909—81/1) Module Experimental Process System Development Unit (MEPSDU). Quarterly report No. 1, November 26, 1980-February 28, 1981.** (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). 1981. Contract NAS-7-100-955909. 39p. NTIS, PC A03/MF A01.

Technical work during the first quarter of the program was directed toward completing all design and documentation tasks associated with the MEPSDU Preliminary Design Review Data Package submittal. Highlights of this effort consisted of: (1) preparation of a preliminary specification for MEPSDU input sheet material (dendritic web silicon); (2) preparation of a MEPSDU module preliminary design layout drawing and all associated detail drawings; (3) analysis of the performance of the MEPSDU module over a range of operating conditions; (4) definition of all steps in the baseline process sequence; (5) initiation of equipment specifications for all long lead time items in the MEPSDU; (6) initiation of preliminary design work on the cassette unload element and interconnect feed element of the automated cell interconnect station; and (7) preparation of the preliminary quality assurance plan. (WHK)

15451 **(DOE/SERI—8119-3/4) Sequential purification and crystal growth for the production of low cost silicon substrates. Annual report, 15 September 1979-14 September 1980.** Liaw, M.; D'Aragona, F.S. (Motorola, Inc., Phoenix, AZ (USA). Semiconductor Group). 1980. Contract AC02-77CH00178. 81p. NTIS, PC A05/MF A01.

The objective of this program is to identify and develop low cost processing for fabricating large grain size polycrystalline silicon substrates. Metallurgical grade silicon (MG-Si) which is low cost and abundant for industrial usage was chosen as starting material. However, MG-Si cannot be used directly as substrates for solar cell fabrication for the following reasons: (1) it contains 1 to 2% metallic impurities, and (2) it is produced as irregular shapes with a fine grain structure. Various purification techniques have been reported. The techniques being studied under this program use direct methods for the purification of MG-Si. The process uses sequential steps of purification followed by crystal growth. The steps of sequential purification include: (1) leaching of MG-Si charge, (2) phase separation of non-soluble impurities from molten silicon, (3) reactive gas treatment of molten silicon, (4) liquid-liquid extraction (called slagging), and (5) impurity redistribution using ingot pulling. All the purification steps, with the exception of step (1), are performed in a consecutive manner using a crystal puller. The purified ingots will be produced in a desired ingot dimension and further recrystallization is not necessary. The theory and experimental results for each purification technique are presented. The relative effectiveness of the various steps are assessed and the most important step(s) are recommended. Finally the electrical characteristics of solar cells built on a thin epitaxial layer deposited on single pulled

MG-Si substrates are discussed and compared to single crystal substrates. (WHK)

15452 (DOE/SERI—9234/1) Photovoltaic mechanisms in polycrystalline thin film silicon solar cells. Quarterly technical progress report No. 1, July 30-October 31, 1980. Sopori, B. (Motorola, Inc., Phoenix, AZ (USA). Solar Energy Dept.). 30 Jul 1980. Contract AC02-77CH00178. 52p. NTIS, PC A04/MF A01.

Major accomplishments during the first quarter of the contract period are reported. Small area diode fabrication and analysis has been continued. This technique has further been applied to many RTR ribbons. An optical technique for determination of crystallite orientations has been placed in operation. This technique has many distinct advantages. These are: (1) rapid; (2) can be set-up very inexpensively; (3) well suited for polycrystalline substrates of small grain size; and (4) can easily characterize twins. Accuracies obtained with this technique are about the same as that of the Laue technique. A technique to qualitatively evaluate grain boundary activity in unprocessed substrates has been used and valuable results obtained. Further analysis is being done to use this technique for quantitative evaluation. A major study of G.B. orientation effects is underway. Initial results on RTR ribbons have shown a good correlation of G.B. barrier height with misorientation (tilt boundaries).

15453 (LBL—12359) Hollow-fiber membranes for photosensitized electron transport. Wamser, C.C.; Otvos, J.W.; Calvin, M. (Lawrence Berkeley Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 31p. NTIS, PC A03/MF A01.

Commercially available cellulose acetate hollow fiber membranes have been investigated for possible use in artificial photosynthesis solar energy schemes. The function of the membrane is to contain the photosensitizer and to separate the oxidized and reduced species which result from photosensitized electron transfer reactions on each side of the membrane wall. Membranes were successfully modified by a process of soaking in a THF solution saturated with porphyrin, followed by a water rinse. This procedure gives dark purple fibers which contain up to 30 mM zinc tetraphenylporphyrin in the fiber walls. A plumbing system has been developed to allow flow of a solution through the inner channels of a 24-fiber bundle while it is immersed in a separate outer solution. Preliminary studies indicate that the fibers are somewhat permeable to both EDTA and dimethyl viologen, the electron donor and acceptor molecules, respectively. Preliminary photochemical studies on cut-up pieces of the treated fiber indicate that it does photosensitize a reaction between EDTA and dimethyl viologen in aqueous solution.

15454 (LBL—12360) Kinetics of photosensitized electron transport across a membrane boundary. Wamser, C.C.; Otvos, J.W.; Calvin, M. (Lawrence Berkeley Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 16p. NTIS, PC A02/MF A01.

A generalized system is described which accomplishes a photosensitized oxidation and reduction and the separation of the resultant oxidized and reduced species across a membrane boundary. A complete reaction mechanism is described and all of the corresponding kinetic steps are defined. A general rate law and an initial rate law are derived by a steady-state analysis. Based upon the rate laws, experimental conditions which should optimize the reaction efficiency are discussed.

15455 (LBL—12361) Magnetic-field effects on photosensitized electron-transfer reactions. Wamser, C.C.; Otvos, J.W.; Calvin, M. (Lawrence Berkeley Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 15p. NTIS, PC A02/MF A01.

Reactions which proceed through the intermediacy of a triplet radical pair can be affected by the application of an external magnetic field of relatively low intensity (100 to 1000 gauss). Since many of the photoreactions utilized in solar energy schemes are electron transfer reactions involving triplet radical pairs, experiments were performed with representative photoreactions to determine if such effects could enhance reaction efficiency. No magnetic field effects were observed in any of the experiments, which included the photosensitized reduction of dimethyl viologen sensitized by $Ru(bipy)_3^{2+}$ or by various porphyrins, in homogeneous aqueous solution or in reversed micelles (water in toluene) or on silica particles. Apparently the magnetic field effects reported in the literature are observable only under specific conditions. Under the conditions normally utilized for typical solar energy photoreactions, magnetic field effects do not appear to be useful for optimizing efficiency.

15456 (PB—80-176878) Wood and energy in New England: a review and bibliography. Bibliographies and literature of agriculture. Palmer, L.; McKusick, R.; Bailey, M. (Office of the Publication Board, Washington, DC (USA)). Apr 1980. 77p. NTIS, PC A05/MF A01.

Because of New England's dependence on petroleum products for energy (89 percent of total energy consumed in 1976 included natural gas), its energy costs are nearly 30 percent higher than the national average. Forest land, covering almost 80 percent of New England, contains a huge volume of fuelwood that could potentially provide the equivalent of 55 million barrels of oil a year. This report reviews a number of fuelwood feasibility studies, fuelwood's role in the national and regional energy picture, wood availability and demand, energy alternatives, and environmental impact.

15457 (SERI—9143/QPR-1) $CdSiAs_2$ thin films for solar cell applications. First quarter report, 4/9/80-7/8/80. Burton, L.C. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Dec 1980. Contract AC02-77CH00178. 16p. NTIS, PC A02/MF A01.

Thin film growth using the single target sputtering system was concluded. The best $CdSiAs_2$ films were obtained from a composite target ($CdAs_2$ + Si), followed by post-deposition reactive heat treatments. The new Perkin-Elmer Randex 2400 8J multi-target sputtering system was installed. A variety of problems arose, which prevented any meaningful runs from being performed with that system over this reporting period. These problems were related to the J-arm, the RF power generator, RF shielding, water cooling, target switches, substrate bias network, vacuum gage controller, graphite heater elements and RF impedance matching network. These problems have been largely corrected. Improvements were made in the magnetic field (van der Pauw), spectral response and variable temperature measurements facilities.

15458 (SERI—9143/QPR-2) $CdSiAs_2$ thin films for solar cell applications. Second quarter report, 7/9/80-10/8/80. Burton, L.C. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Jan 1981. Contract AC02-77CH00178. 17p. NTIS, PC A02/MF A01.

Early problems associated with the Randex multi-target sputtering unit were rectified. $CdAs_2$, Si and Cd targets were obtained from commercial vendors. Runs have been made using $CdAs_2$ and Si targets separately. The $CdAs_2$ deposition rate falls off rapidly with increasing substrate temperature, but the compositions remain nearly stoichiometric. Dual target runs were performed with $CdAs_2$ and Si targets. Films on 7059 substrates are amorphous, with composition depending strongly on sputtering parameters. A dual target run made on polished GaAs targets resulted in a crystalline film, although of low Si composition. $CdSiAs_2$ (211) and (112) peaks were identified in the x-ray spectrum. Additional problems with the Randex unit precluded further runs in that system.

15459 (SERI/PR—8002-7-T1) Development of photoelectrochemical cells based on compound semiconductors and nonaqueous electrolyes. Quarterly technical progress report, August 1, 1980-October 31, 1980. Rauh, R.D. (EIC, Inc., Newton, MA (USA)). Dec 1980. Contract AC02-77CH00178. 27p. NTIS, PC A03/MF A01.

A solar cell using polyvinylpyrrolidone treated polycrystalline n-GaAs and CH_3CN, I_3^-/I^- electrolyte achieved a power conversion efficiency of 4.3% with i/sub sc/ = 11.6 mA/cm², V/sub oc/ = -0.485V, P/sub max/ = 2.3 mW/cm², ff = 0.40 at 53.3 mW/cm² Xe arc intensity. A p-GaAs electrode in the same acetonitrile electrolyte gives photovoltages similar to those reported for aqueous HI/I_2 electrolyte, but the photocurrent decays rapidly with time. Exploratory work on p-Zn_3P_2 indicates that nonaqueous electrolytes will probably be required for EPCs based on this semiconductor due to a dark reaction of Zn_3P_2 with H_2O to liberate

PH_3. Stable photoresponse was obtained in CH_3CN, I_3^-/I^-. Optimum thickness of electrodeposited CdSe films on titanium substrates was determined to be $>3\mu$. Anodization and dipping in $ZnCl_2$ solution improves i/sub sc/ and V/sub oc/, respectively, to give electrodes capable of >4% efficiency in aqueous polysulfide at 67 mW/cm^2 tungsten-iodine lamp intensity. Prototype solar cells of 4 cm^2 area suffer a reduction in efficiency due to iR drop between the electrodes and counter electrode polarization. The former may be reduced by perforating the photoelectrode. Photoaction spectra of electrodeposited CdSe films have been obtained with a newly constructed apparatus for recording source-corrected photocurrent action spectra of semiconductor electrodes.

15460 (SERI/PR—9131-1-T2) Controlled cadmium telluride thin films for solar cell applications. Second quarterly report, September 1-December 1, 1980. Das, M.B.; Krishnaswamy, S.V. (Pennsylvania State Univ., University Park (USA). Materials Research Labs.). Jan 1981. Contract AC02-77CH00178. 23p. NTIS, PC A02/MF A01.

A thermal annealing procedure to improve the photovoltaic and other electrical characteristics of CdTe sputtered films doped with In is described. For an understanding of the characteristics of these films, SEM, Auger electron spectroscopy and scanning ellipsometry analyses have been carried out. Dark and illuminated I/V characteristics and capacitance and conductance vs. frequency behavior of In doped CdTe Schottky barrier diodes based on Cr and Ni substrates indicate that thermal annealing is an effective means of reducing the trap concentrations on these films that can lead to a significant improvement of the quality of sputtered films for solar cell applications.

15461 (SERI/PR—9133-1-T1) High efficiency thin film CdTe solar cells. Second quarterly progress report, July 1, 1980-September 30, 1980. Johnson, B.; Serreze, H.B.; Reiff, G.; Entine, G.; Goldner, R.B. (Radiation Monitoring Devices, Inc., Watertown, MA (USA)). Nov 1980. Contract AC02-77CH00178. 28p. NTIS, PC A03/MF A01.

Thin films of CdTe have been vacuum deposited onto glass and ITO-coated glass substrates using a hot-wall technique. Improved source conditions and system cleanliness have enabled large pinhole-free regions capable of providing our first large area evaporated Au devices (greater than 1 cm^2). An optimized Au thickness has been determined and characterized in terms of sheet resistance and optical transmission. An evaporated Au/Ag combined grid and a SiO AR coating have yielded 1 cm^2 active area Au-CdTe-ITO devices with J/sub sc/ = 13 mA/cm^2 and V/sub oc/ of 0.43 volt. The 1.4% efficiency is only temporarily limited by the uncharacteristically low 0.25 fill factor which is believed to be caused by an anomaly near the ITO contact. A three-source system with effusion cell type sources and a rotary shutter has been designed, built, and successfully tested. This more sophisticated system should greatly improve our control over film and device reproducibility and also provide greater versatility in controlling doping concentration and film stoichiometry. In addition, this new system will allow for in situ deposition of an In flash in order to improve the ITO-CdTe contact behavior. Furthermore, the system offers possibilities for p-n junction deposition without breaking vacuum.

15462 (SERI/PR—9196-1-T1) Indium phosphide/cadmium sulfide thin-film solar cells. Quarterly report, July-October 1980. Zanio, K. (Hughes Research Labs., Malibu, CA (USA)). Jan 1981. Contract AC02-77CH00178. 23p. NTIS, PC A02/MF A01.

InP thin films were deposited by planar reactive deposition on recrystallized CdS (RXCdS) and semi-insulating (100) InP substrates and evaluated as potential layers for an all-thin-film solar cell. One objective of this period was to grow InP on RXCdS at a substrate temperature which is high enough to permit the growth of p-type material but yet low enough to permit the epitaxial growth of large grains. Films prepared on RXCdS at approximately 330°C contained a mixture of grains having both large and submicron lateral dimensions. Be-doped epitaxial films, deposited on semi-insulating InP at 330°C, showed both n- and p-type behavior. Films prepared at higher temperatures with a freshly Be-charged indium source were p-type. However, at these temperatures, layers prepared after several runs with the same source were n-type. Analyses of the indium source and films were initiated to determine the cause of the transient doping.

15463 (SERI/PR—9216-1-T2) Cadmium sulfide/copper selenide cell research copper selenide-based thin film solar cells. Second quarterly technical progress report, September 1, 1980-December 1, 1980. Sauve', S.P.; Mickelsen, R.A.; Stewart, J.M.; Chen, W.S. (Boeing Aerospace Co., Seattle, WA (USA)). 1980. Contract AC02-77CH00178. 20p. NTIS, PC A02/MF A01.

The objective of this program is to investigate the use of Cu/sub 2-x/Se to produce low cost, high efficiency photovoltaic solar cells. The Cu/sub 2-x/Se films are produced by coevaporation of Cu and Se from separate, individually controlled vapor sources onto heated glass substrates. This method gives greater composition controllability and is readily adaptable to large scale production efforts. Two quartz crystal microbalances are used to separately monitor the Cu and Se deposition rates. The structural, electrical, and optical properties of the Cu/sub 2-x/Se films have been measured for deposits made on 250°C substrates. The optical absorption measurements show the material having an indirect band gap of 1.4 eV and a direct gap of 2.2 eV. These values are for stoichiometric indices in the range of $0.17 \leqq x \leqq 0.26$. Hall and conductivity measurements give hole mobilities in the range of 3 to 7 cm^2/Vsec and hole densities of the order of 4×10^{22} cm^{-3}. For deposits made on substrate at 160°C, the mobility is in the range of 3 to 10 cm^2/Vsec and hole densities on the order of 10^{18} to 10^{21} cm^{-3} for $0.1 \leqq x \leqq 0.3$. To date, the best cell has photovoltaic characteristics of J/sub sc/ = 11.6 mA/cm^2, V/sub oc/ = 460 mV, F.F. = 0.62 and eta = 3.3% when tested under simulated AM1 illumination. In an effort to improve cell performance, low resistance CdS was used. Cell performance degraded considerably with the low resistance CdS resulting in substantially lower values for both V/sub oc/ and I/sub sc/. It is believed in part that this difficulty can be traced to pinhole defects in the ITO electrode. When the low resistance CdS is deposited on ITO, regions in the CdS appear to be high in Cd where pinholes in the ITO were observed.

15464 (SERI/PR—9330-1-T1) Preparation and properties of evaporated CdTe films compared with single crystal CdTe. Progress report No. 1, October 1, 1980-January 31, 1981. Bube, R.H. (Solar Energy Research Inst., Golden, CO (USA)). 1981. Contract AC02-77CH00178. 27p. NTIS, PC A03/MF A01.

This program is concerned with the investigation of the materials properties of CdTe thin films deposited by hot-wall vacuum evaporation and of CdTe single crystalline material, particularly those relevant to solar cell applications in which CdTe is the absorbing member. Progress is reported on: (a) an evaluation of CdTe homojunctions formed by HWVE of CdTe by Walter Huber at the laboratory of Dr. Adolfo Lopez-Otero at the Institut fuer Physik of the University of Linz, using single crystal p-type CdTe from Stanford as a substrate; (b) the design and construction of a HWVE apparatus at Stanford; and (c) properties of grain boundaries in large grain polycrystalline CdTe.

15465 (SERI/TR—8002-8-T1) Electrochemical photovoltaic cells CdSe thin film electrodes. Final report, June 1979-June 1980. Russak, M.A.; Reichman, J.; DeCarlo, J.; Creter, C. (Grumman Aerospace Corp., Bethpage, NY (USA). Research Dept.). Jul 1980. Contract AC02-77CH00178. 63p. NTIS, PC A04/MF A01.

Progress on developing stable, thin-film CdSe electrodes with sunlight conversion efficiency of 10% for use with aqueous polysulfide electrolytes in frontwall and backwall illuminated EPCs is reported. The main effort has been directed towards establishing the relationships among thin-film processing, resultant electronic properties and I-V performance in order to produce electrodes with maximum power conversion efficiency. The most encouraging results have been obtained with CdSe thin-film electrodes produced in two ways for frontwall cells. Films were deposited on titanium at approximately 100°C with a high Se/Cd ratio and then heat treated in air at 350 to 400°C. These films usually have a very fine grained microstructure after heat treatment and the resultant electrodes exhibit fairly square I-V characteristics with fill factors of

0.6 or greater and high current output. The overall power efficiency of these electrodes is limited by relatively low output voltages. At present, power conversion efficiencies of 3 to 5% can be obtained reproducibly at simulated AM2 conditions with electrodes processed in this manner. The second type of film that has yielded very promising results is deposited on titanium at substrate temperatures greater than 400°C. The interesting feature of these electrodes is their increased open circuit voltage. However, the current output and fill factor are lower. As a result, the power conversion efficiency of these electrodes is 3 to 4%. Backwall electrodes with an efficiency of greater than 4% and short circuit densities near theoretical for AM2 conditions have been produced.

15466 **(SERI/TR—8081-1-T3) Materials for high efficiency monolithic multigap concentrator solar cells. Semiannual report, 1 July-31 December 1980.** (Varian Associates, Inc., Palo Alto, CA (USA)). 1980. Contract AC02-77CH00178. 25p. NTIS, PC A02/MF A01.

The objectives of this work are to develop a materials technology of the AlGaInAs and AlInAsSb mixed crystal systems. These technologies are directed towards the development of a two-gap, monolithic, lattice-matched concentrator cell with 28% or higher AM2 conversion efficiency at 500 to 1000 suns. The work to be performed is subdivided into the five major tasks: (1) develop and demonstrate the technology for a grading layer of GaInAs/GaAs and low-bandgap cells in AlGaInAs/GaInAs/GaAs; (2) develop and demonstrate intercell tunnel junction contacts in the higher bandgap AlGaInAs alloys; (3) develop and demonstrate technology for a higher bandgap concentrator cell in AlGaInAs alloys; (4) demonstrate a complete two-gap monolithic concentrator cell with AM2 efficiency of 28% or more; and (5) investigate the potential of AlInAsSb alloys grown on InAs substrates. Progress is reported.

15467 **(SERI/TR—8278-1-T4) Vacuum-deposited polycrystalline silicon films for solar-cell applications. Final technical report, September 14, 1979-December 1, 1980.** Feldman, C.; Arrington, C.H. III; Blum, N.A.; Satkiewicz, F.G. (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Dec 1980. Contract AC02-77CH00178. 184p. NTIS, PC A09/MF A01.

A potentially all-vacuum fabrication process for forming thin film polycrystalline silicon solar cells has been explored in which the solar cell was constructed in layers, as follows: alumina (or sapphire) substrate/TiB_2 bottom electrode/p-type polycrystalline silicon film/n-type polycrystalline silicon film/Ti-Ag top electrode. Techniques were developed for forming stable, low resistivity thin films of TiB_2. The p-layer was vacuum deposited by electron beam heating of Si and B sources. The n-layer was formed both by thermal diffusion and by silicon deposition in a phosphine atmosphere. Both methods yielded photodiodes; the diffused junctions were studied more extensively and consequently produced the higher efficiency devices. Emphasis was placed on producing thin (10 to 15 μm) silicon films with high purity and large grain size (20 to 40 μm). The presence of the underlying TiB_2 layer was found to be essential for the growth of large Si grains. The interactions between Si and TiB_2 were studied extensivey by secondary ion mass spectrometry (SIMS) and x-ray diffraction techniques. SIMS was also used to determine doping and impurity profiles. The best photovoltaic response without an antireflection coating was obtained from small ($\leqq$ 1 mm^2) devices with base p-type region grain sizes larger than 5 μm; typical AM-1 photovoltaic parameters were: V/sub oc/ $\cong$ 300 mV, J/sub sc/ $\cong$ 14 mA/cm^2 ff $\cong$ 0.60, eta $\cong$ 2.5%. Recommendations are made for further studies which should lead to improved performance of the thin film cells.

15468 **Energy from biomass and wastes: an overview.** Klass, D.L. Chicago, IL; Institute of Gas Technology (1980). 35p. (CONF-801185—1).

From Symposium on fuels and feedstocks from tropical biomass; San Juan, Puerto Rico (24 Nov 1980).

Energy from biomass and wastes already contributes about 850,000 barrels oil equivalent per day to US primary consumption. Recent changes in Federal funding of energy projects are expected to stimulate commercialization of additional biomass energy systems, particularly those processes that utilize biomass and wastes for the manufacture of ethanol fuel. However, although research and development on biomass production and conversion is progressing at a rapid rate, commercialization of non-ethanol and non-combustion based processes has been minimal. Commercial plants in the United States currently include one municipal solid waste gasification plant, one manure gasification plant which was recently shut down, and eight landfill methane recovery systems.

15469 **Albany biomass-to-oil project.** Ergun, S.; Schaleger, L.; Seth, M. (Univ. of California, Berkeley). pp 149-158 of Design and management for resource recovery. Volume 1. Energy from waste. Frankiewicz, T.C. (ed.). Ann Arbor, MI; Ann Arbor Science Publishers Inc. (1980).

A modest effort in the US is now being devoted to converting wood wastes and agricultural residues to oil. A process development unit was designed and constructed (December 1976) at Albany, OR. The process development effort at Albany is supplemented by supporting research and engineering programs conducted elsewhere. The ongoing activities are reviewed and the scope and economic feasibility of oil derived from biomass are discussed.

15470 **Conversion of cellulosic wastes to liquid fuels.** Kuester, J.L. (Arizona State Univ., Tempe). pp 181-195 of Design and management for resource recovery. Volume 1. Energy from waste. Kuester, J.L. Ann Arbor, MI; Ann Arbor Science Publishers Inc. (1980).

A process is described for converting renewable biomass to equivalents of existing commercial liquid-fuel products (e.g., diesel, kerosene, jet fuel and high-octane gasoline). An indirect liquefaction approach is used, i.e., thermal gasification followed by liquid-fuels synthesis. The use of catalysts is incorporated in the reaction steps. The research scale unit is, for the most part, a commercial simulation with continuous, realistic processing steps. The process is capable of using a variety of feedstocks from urban, agricultural, forest and industrial sources. Quality products can be produced with anticipated yields of 50 to 100 gal liquid fuel/ton of feedstock (dry, ash-free). The use of catalysts results in very mild operating conditions throughout the process. The cumulative residence time for all reaction steps is about 30 sec. Gas separation steps are not required. Environmental problems are expected to be minimal. Research in progress is aimed at an assessment of alternative feedstocks, gasification-system optimization, waste stream characterization and liquid-fuels tailoring. Economic projections indicate a profitable scale of 270 to 900 metric ton/day (300 to 1000 ton/day) of feedstock (at $10 to 20/ton feedstock cost and current liquid-fuel revenues). A 9-metric ton/day (10 ton/day) pilot plant is a preliminary step to develop further engineering data required for commercial-scale design and produce sufficient amounts of product for applications testing.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 15447, 15450, 15551, 15552

15471 **(ANL/AA—20) Preliminary assessment of the Satellite Power System (SPS) and six other energy technologies.** Wolsko, T.; Brown, C.; Cirillo, R. (Argonne National Lab., IL (USA)). Apr 1980. Contract W-31-109-ENG-38. 188p. NTIS, PC A09/MF A01.

The comparative assessment portion of the Satellite Power System (SPS) Concept Development and Evaluation program established by the Department of Energy and the National Aeronautics and Space Administration to generate information from which a rational decision could be made regarding the viability of the SPS is presented. The objective of the comparative assessment is to develop an initial understanding of the SPS with respect to a limited set of energy alternatives. Six alternative technologies (conventional coal combustion; light water reactor; coal gasification/combined cycle; liquid-metal, fast-breeder reactor; terrestrial photovoltaic; and fusion) were compared to the SPS on the basis of available data on cost and performance, health and safety, environmental welfare, resource requirements, and economics. These comparisons are descriptive and do not culminate in any bottom line regarding the overall viability of the SPS.

15472 (DOE/CS/31037—T1) Block V solar cell module: design and test specification for intermediate-load applications, 1981. (Jet Propulsion Lab., Pasadena, CA (USA)). 20 Feb 1981. Contract AI01-76CS31037. 38p. NTIS, PC A03/MF A01.

The requirements for the design and test of terrestrial solar cell modules for one phase of DOE's Low-Cost Solar Array Project are presented. Intermediate-load modules designed to meet this specification will generally have the following design features and characteristics: (1) nominal operating voltage (V/sub no/) between 5 Vdc and 20 Vdc; (2) ability to be series-connected to worst-case open-circuit voltages of 1000 Vdc; (3) dimensions not exceeding 1.22 m x 2.44 m (4 ft x 8 ft); (4) flat-plate configuration (non-concentrating); and (5) output power referenced to nominal operating conditions and V/sub no/. In addition to module design and performance requirements, a series of characterization and qualification tests are also specified.

15473 (DOE/ET/20279—112) Detection of electrically failed photovoltaic modules at MIT LL test sites. Forman, S.E. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). Feb 1981. Contract AC02-76ET20279. 26p. NTIS, PC A03/MF A01.

The US Department of Energy has set a 20-year lifetime goal for terrestrial photovoltaic modules. In its capacity as a Photovoltaic Field Test and Application Center, Massachusetts Institute of Technology Lincoln Laboratory has established various experimental test sites throughout the United States, ranging in size from 1.5 to 100 kW of peak power. These sites contain modules from several manufacturers and serve as test beds for photovoltaic system components. Between May 1977 and the present, over 11,000 modules have been placed into service at these sites, with a total of approximately 250 electrical failures. In previous reports, emphasis has been placed on failure modes and the types of physical and electrical degradation found in modules. The methods used to detect these failures in operational photovoltaic power-generating systems are reported for several MIT Lincoln Laboratory test sites.

15474 (DOE/ET/20279—119) Detection of electrically failed photovoltaic modules at selected MIT Lincoln Laboratory test sites. Forman, S.E. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1981. Contract AC02-76ET20279. 5p. (CONF-810509—5). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

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15475 (SAND—79-2330) SOLSTOR description and user's guide. Aronson, E.A.; Caskey, D.L.; Caskey, B.C. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 131p. NTIS, PC E05/MF $3.50.

Includes 2 sheets of 48 reduction microfiche.

The computer simulation code SOLSTOR is described. The code simulates energy systems in which electricity is generated by either a photovoltaic (PV) system or a wind turbine generator (WTG). Storage may or may not be present. Backup electricity, if needed, is provided either from a utility grid or from a fuel-burning generator. SOLSTOR minimizes the life cycle cost of providing energy by choosing the optimal solar or wind system component sizes. Rates for electricity purchased from the grid can include time-of-day (TOD) energy charges as well as time-of-day peak demand changes. Sell-back to the grid of excess collected energy is also considered.

15476 (SAND—80-2576C) Introducing the new photovoltaic data reduction center. Pruett, H.D.; Muldoon, J.T.; Kriloff, H.Z. (Sandia National Labs., Albuquerque, NM (USA); Boeing Computer Services Co., Seattle, WA (USA)). 1981. Contract AC04-76DP00789. 12p. (CONF-810509—3). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

Sandia National Laboratories, in conjunction with Boeing Computer Services, has developed a data and information system to collect data from various photovoltaic experiments. A Data Reduction Center in Renton, WA, archives the data, analyzes it, and generates monthly performance reports of potential interest to researchers, designers, and other data users. Due to the rapidly evolving nature of the photovoltaic field, particular emphasis has been placed on making reports available in a timely manner, and on making the DRC structure flexible enough to adapt to changing requirements. The overall structure incorporated in the data and information system is described, details of the hardware and software utilized are presented, and the output product (monthly performance reports) is illustrated with examples taken from experimental sites that are now operational.

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 15507, 15509, 15521, 15718

15477 (DOE/ET/20216—4) Solar total energy: large scale experiment, Shenandoah, Georgia Site. Annual report, June 1978-June 1979. Ney, E.J. (Georgia Power Co., Atlanta (USA)). Jul 1979. Contract AB04-77ET20216. 119p. NTIS, PC A06/MF A01.

A background summary and a complete description of the progress and current status of activities relative to the Cooperative Agreement for the Solar Total Energy - Large Scale Experiment at the Bleyle Knitwear Plant at Shenandoah, Georgia are presented. A statement of objectives and an abstract of progress to date are included. This is followed by a short introduction containing a project overview, a summary of the participants and their respective roles, a brief description of the Solar Total Energy System (STES) design concept, and a chronological summary of progress to date. A general description of the site is given, a detailed report of progress is reported, and drawings and equipment lists are included. The closed-loop solar energy system planned for Shenandoah begins with circulation of Syltherm 800, a heat transfer fluid of the Dow-Corning Corporation, through the receiver tubes of a parabolic dish solar collector field. As solar energy is focused on the receivers, the heat transfer fluid is heated to approximately 399°C (750°F) and is pumped to a heat exchanger for immediate use, or to a thermal storage system for later use. Once in the heat exchanger, the fluid heats a working fluid that produces the steam required for operating the turbine. After performing this task, the heat transfer fluid returns to the collectors to repeat the cycle, while the steam turbine-generator system supplies the electrical demands for the knitwear plant and the STES. During STES operation, maximum thermal and electrical requirements of the application are expected to be at 1.08 MWth and 161 kWe, respectively. During the power generation phase, some of the steam is extracted for use as process steam in the knitwear manufacturing process, while exhaust steam from the turbine is passed through a condenser to produce hot water for heating, domestic use, and absorption air conditioning. (WHK)

15478 (DOE/SF/10601—1) Economic assessment of advanced central-receiver solar-thermal power systems. Final report. (Westinghouse Electric Corp., East Pittsburgh, PA (USA). Advanced Systems Technology Div.). Oct 1980. Contract AC03-79SF10601. 211p. NTIS, PC A10/MF A01.

This study was performed to estimate the value and potential electric utility impact of several advanced central receiver solar-thermal plant concepts in the role of electric generating stations. The impact of interest included economics, the cost of producing

electricity, fuels displaced, and utility system reliability. The central receiver plants evaluated included solar/fossil hybrid concepts and solar stand-alone plants with thermal storage. Liquid metal/molten salt, closed Brayton cycle, improved water-steam, and combined Brayton/Rankine cycle concepts were among those investigated. Detailed modeling of the operation of these plants, as they would operate on several electric utility systems, was the basis of the analysis for this study. Because of the uncertainty of many assumptions, sensitivity analysis was used. Analysis to optimize collector area and storage capacity was also performed. The study indicates that if the DOE cost goals can be achieved and predicted solar plant performance attained, then the advanced solar-thermal concepts can be competitive in regions with good insolation and some continued use of oil or other surrogate distillate or gaseous fuels. Some thermal storage (3 to 6 hours) was also found to be desirable for most applications.

15479 **(DOE/SF/10601—2) Economic assessment of advanced central-receiver solar-thermal power systems. Report of PG and E assessment.** (Westinghouse Electric Corp., East Pittsburgh, PA (USA). Advanced Systems Technology Div.). Jan 1981. Contract AC03-79SF10601. 53p. NTIS, PC A04/MF A01.

This study was performed to estimate the value and potential impact of two advanced central-receiver solar-thermal plant concepts, in the role of electric generating stations, on the Pacific Gas and Electric system. The plants evaluated included solar/fossil hybrid concepts and solar stand-alone plants with thermal storage. Liquid metal/molten salt and combined Brayton/Rankine cycle concepts were investigated. The analysis was based on the operation of the Pacific Gas and Electric system with these plants modeled in detail on the system. Sensitivities to insolation site, collector area and thermal storage were investigated. The study indicates that if the DOE cost goals can be obtained along with the solar plant performance projected, the advanced central-receiver solar-thermal plants investigated can be economically justified on the Pacific Gas and Electric system. Solar/fossil hybrid plants showed no distinct economic advantage over solar stand-alone plants. The solar-thermal plants should be considered for location outside of the Pacific Gas and Electric service area where insolation quality is higher.

15480 **(DOE/SF/10601—T1) Economic assessment of advanced central-receiver solar-thermal power systems. Executive summary.** (Westinghouse Electric Corp., East Pittsburgh, PA (USA). Advanced Systems Technology Div.). Oct 1980. Contract AC03-79SF10601. 23p. NTIS, PC A02/MF A01.

This study was performed to estimate the value and potential electric utility impact of several advanced central-receiver solar-thermal plant concepts in the role of electric-generating stations. The impacts of interest included economics, the cost of producing electricity, fuels displaced, and utility system reliability. The central receiver plants evaluated included solar/fossil hybrid concepts and solar stand-alone plants with thermal storage. Liquid metal/molten salt, closed Brayton cycle, improved water-steam, and combined Brayton/Rankine cycle concepts were among those investigated. This volume contains the executive summary.

15481 **(DOE/SF/11421—1) Financial study of commercialization of solar central receiver power systems. Final report.** (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Mar 1981. Contract AC03-80SF11421. 104p. NTIS, PC A06/MF A01.

Commercialization requires that central receiver (CR) systems meet the economic criteria used by industry to select systems for capital ventures. If these systems cannot offer comparability in present and expected cost (weighted by perceived risk) to alternate energy sources then industry simply will not invest in the equipment. This work provides quantitative estimates of the investment required by government, utilities, and the manufacturing sector to meet the energy displacement goals for central receiver technology. Initial solar repowering and stand-alone electric utility plants will not have economic comparability with competitive energy sources. A major factor for this is that initial (first of a kind) heliostat costs will be high. As heliostat costs are reduced due to automated manufacturing economies, learning, and high volume production, central receiver technology will become more competitive. Under this task, several scenarios (0.1, 0.5, and 1.0 quad/y) were evaluated to determine the effect on commercial attractiveness and to determine the cost to government to bring about commercialization of solar central receivers.

15482 **(SAND—78-1315(Rev.)) User's manual for computer code SOLTES-1B: simulator of large thermal energy systems.** Fewell, M.E.; Grandjean, N.R. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1980. Contract AC04-76DP00789. 345p. NTIS, PC A15/MF A01.

SOLTES simulates the steady-state response of thermal energy systems to time-varying data such as weather and loads. Thermal energy system models of individual components and simple and complex systems can be modularly constructed from a library of routines. These routines mathematically model solar collectors, pumps, switches, thermal energy storage, thermal boilers, auxiliary boilers, heat exchangers, extraction turbines, extraction turbine/generators, condensers, regenerative heaters, air conditioners, process vapor, etc. Fluid names need only be specified to obtain the proper heat-transfer fluid property data and power-cycle/refrigeration working fluid constants from a fluid property data bank. Load management allows SOLTES to simulate total energy systems that simultaneously follow process heat and power loads and demands. Power, heating, and/or cooling requirements of each component in the system model can be satisfied by other components in the system or externally. Cooling, heating, electrical, mechanical, thermal, and/or hot-water loads may be read from a data file, combined by category, scaled and/or peak-shaved, and followed. Hourly weather data for typical meteorological years for 26 locations in the US are used, or the user can supply weather data with any time increment. Generalized energy accounting is available and instantaneous and integrated values for system performance parameters may be automatically determined. System performance and energy accounting parameters may be written to a file for access by user-supplied programs for economic, rate, or auxiliary supply analyses, etc. SOLTES can be used to simulate a wide variety of thermal energy systems such as solar power/total energy, fossil-fired power plants/total energy, nuclear-fired power plants/total energy, solar energy heating and cooling, geothermal energy, and solar hot water.

15483 (SAND—80-1666, pp 23-44) **Sensitivity analysis of Solar Rankine Cogeneration Systems.** Peters, R.R. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Sandia National Laboratories is evaluating a Performance Prototype Trough (PPT) Collector as a part of the Department of Energy's research and development program for solar-thermal energy systems. Included in this effort are analyses to determine the most advantageous use of second-generation trough collectors similar to the PPT. The sensitivity of the Solar Rankine Cogeneration (SRC) System design and economic feasibility to changes in system parameters has been investigated. SRC systems also were compared to Solar Process Heat (SPH) and Fossil Fuel Total Energy (FFTE) Systems. The results of this analysis are discussed.

15484 (SAND—80-1666, pp 45-49) **SOLTES (Simulator of Large Thermal Energy Systems).** Fewell, M.E.; Grandjean, N.R. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

SOLTES, a computer code that can be used to simulate a wide variety of thermal energy systems, is briefly described. System models are modularly constructed from routines in a routine library. (This library may include user written routines.) Due to its software structure, SOLTES can be used, without penalty, to simulate small systems, individual components, and subsystems as well as large systems that may include Rankine-type power generation. Input to SOLTES is proportional to the size and complexity of the system model. Contacts for information on SOLTES are given. (WHK)

15485 (SAND—80-1666, pp 51-58) **Operation of the Willard Solar Irrigation Project.** Fenton, D.L.; Abernathy, G.H.; Krivokapich, G.A.; Ellibee, D.E.; Chilton, V. (New Mexico State Univ., Las Cruces). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The solar-thermal Rankine cycle power system located near Willard, New Mexico is described including the modifications made during operation. Additionally, a maintenance summary is given. System operation results are given for the summer solstice, June 21, 1980.

15486 (SAND—80-1666, pp 59-65) **Coolidge 150 kWe Solar Irrigation Project.** Larson, D.L. (Univ. of Arizona, Tucson). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Construction of a 150 kW solar thermal-electric power plant on an irrigated farm near Coolidge was completed in autumn, 1979. The plant, designed by Acurex Corporation, includes over 2100 m^2 of Acurex-made parabolic trough type collectors and an organic Rankine cycle turbine engine built by Sundstrand Corporation. The plant is interconnected with the electrical utility grid. The installation is being operated by The University of Arizona with Sandia Laboratories direction. Operation is providing an evaluation of equipment performance and operating and maintenance requirements as well as the desirability of an on-farm location.

15487 (SAND—80-1666, pp 67-78) **IEA/SSPS 500 kW Distributed Collector System.** Dehne, H.; Duffy, D.R. (Acurex Corp., Mountain View, CA). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The design and status of the 500-kW demonstration solar thermal power plant being built in the province of Almeria in southern Spain are described. The plant includes two fields of parabolic trough collectors; one field designed and manufactured by Acurex Corporation and the other field designed and manufactured by M.A.N. Neue Technologie, a German company. The plant will employ thermocline heat storage and a steam turbine conversion system. The schedule calls for completion and turnover of the plant by August 1, 1980. (WHK)

15488 (UCLA—12-1284) **Mineralization of carbon during moist incubation of soil JF79 treated with organic heat-transfer and storage fluids.** Nishita, H.; Haug, R.M. (California Univ., Los Angeles (USA). Lab. of Biomedical and Environmental Sciences). Jan 1981. Contract AC03-76SF00012. 15p. NTIS, PC A02/MF A01.

Biodegradability of four heat transfer/storage fluids (ethylene glycol, Therminol 66, Caloria HT43, and Dow Corning Fluid No. 200) were examined. The degradation was monitored by periodically measuring the mineralization of carbon in moist fluid-contaminated soils incubated at 28° and 37°C for 8 weeks. Ethylene glycol mineralized relatively readily. The other three fluids did not show measurable amount of carbon mineralization during the experimental period. This implies potential long term environmental effects of mismanaged or accidental releases of these fluids into natural environment.

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

15489 (DOE/ET/21039—1) **Ocean thermal energy conversion power system development. Phase II. Final design report.** (Westinghouse Electric Corp., Lester, PA (USA)). 30 Jun 1980. 523p. NTIS, PC A22/MF A01.

The PSD-I program provides a heat exchanger system consisting of an evaporator, condenser and various ancillaries with ammonia used as a working fluid in a closed simulated Rankine cycle. It is to be installed on the Chepachet Research Vessel for test and evaluation of a number of OTEC concepts in a true ocean environment. It is one of several test articles to be tested. Primary design concerns include control of biofouling, corrosion and erosion of aluminum tubes, selection of materials, and the development of a basis for scale-up to large heat exchangers so as to ultimately demonstrate economic feasibility on a commercial scale. The PSD-I test article is devised to verify thermodynamic, environmental, and mechanical performance of basic design concepts. Operating data and experience will be developed to: (1) provide evaluation and potential solutions to critical issues: (a) control of biofouling; (b) control of erosion and corrosion; and (c) operational dynamics and transients; (2) confirm design decisions; (3) verify design algorithms to permit scaling to larger sizes; (4) evaluate a cost effective aluminum tube material; and (5) establish operating procedures. The test article design and test program are described in detail. (WHK)

15490 (LBL—12327) **Physical oceanographic data from the OTEC Punta Tuna, Puerto Rico Site, September 1979-June 1980.** Frye, D.; Davison, A.; Leavitt, K. (Lawrence Berkeley Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 170p. NTIS, PC A08/MF A01.

The first results of an oceanographic measurement program being conducted off the southeast corner of Puerto Rico are presented. The study site is a proposed OTEC site and is located about 20 km off Punta Tuna. The objectives of the measurement program are to document the physical oceanography of the site as related to the engineering and environmental factors involved in OTEC design and operation. Oceanographic measurements include: (1) a subsurface mooring instrumented with five current, temperature, and pressure recorders; and (2) quarterly hydrographic cruises to measure salinity, temperature, and depth profiles on a grid of 33 stations in the vicinity of the mooring site. The first cruise, conducted between 16 and 21 June 1980, included the initial mooring deployment and a CTD (conductivity, temperature, and depth) and XBT (expendable bathythermograph) survey. The CTD/XBT measurements are presented. Also included are results of in situ current, temperature, and pressure measurements made during two previous programs. In September 1979, Coastal Marine Research (CMR) deployed a mooring at approximately the same site as the present mooring. Results from three of these instruments are included. The Naval Underwater Systems Center deployed a mooring at this site in February 1979 and partial results from one instrument on this mooring are also presented. (WHK)

15491 **Salinity gradient energy conversion.** Mehta, G.D.; Jain, S.C.; Fraser, M.D.; Senatore, S.J.; Rothstein, H.L. (Inter Technol/Sol Corp, Warrenton, Va). pp 566-571 of Ocean conference. Piscataway, NJ; IEEE (1979).

From MTS Oceans conference; San Diego, CA, USA (Sep 1979).

The feasibility of Osmo-Hydro Power (OHP) systems to generate electricity in a practical and economic manner from aqueous saline solutions is discussed. Initial design of a 50-kWe system using brackish water and saturated brine is presented. Preliminary estimates show that for larger units the capital cost of such a system will be around $4,000 to $5,000 per net kWe. 7 refs.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 15482, 15482, 15484, 15509, 15509, 15517, 15751, 15774

15492 (BNL—27722) **Solr assisted heat pump research and development program in the United States.** Andrews, J.W. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 16p. (CONF-8005150—1). NTIS, PC A02/MF A01.

From ISES workshop on performance of heat pump systems; Aachen, F.R. Germany (8 May 1980).

A review of the historical progress and current status of the solar assisted heat pump research and development, supported by the United States Department of Energy, is presented. Much of this work has had as its focus the need for a better source of auxiliary or backup heat than the electric resistance which has generally been assumed in computer simulations of these systems. The two leading candidates are the use of the ground as an alternate heat source/sink or storage element (ground coupling) and the use of fossil fuel burned on site (the bivalent system). The United States program has emphasized ground coupling. Much of the analytical work and heat pump development is applicable to bivalent systems,

and some results of this work are discussed. Project descriptions and technical accomplishments for the currently active projects are presented.

15493 **(DOE/CS/30438—1) Analysis of the impact of decentralized solar technology on electric utilities: comparison and synthesis of models. Progress report.** Feldman, S.; Blair, P. (Pennsylvania Univ., Philadelphia (USA). Energy Center). 20 Nov 1980. Contract AC02-80CS30438. 19p. NTIS, PC A02/MF A01.

The validation of the physical submodels of three solar-electric utility interface models is described. The validation problem is divided into two components, the accuracy of the submodels themselves and the accuracy of the data typically used to run these models. The data set required to study these problems with respect to utility requirements is discussed and its collection in the Philadelphia Metropolitan area described. The instrumentation employed in the gathering of the data is covered. Error statistics of data and submodel accuracy are presented and the current status of the study is presented.

15494 **(DOE/NASA/CR—161642) Solar hot water system installed at Las Vegas, Nevada. Final report.** (La Quinta Motor Inns, Inc., San Antonio, TX (USA)). Jan 1981. Contract FG01-77CS31654. 41p. NTIS, PC A03/MF A01.

The solar hot water system installed at LaQuinta Motor Inn Inc., at Las Vegas, Nevada is described. The Inn is a three-story building with a flat roof for installation of the solar panels. The system consists of 1200 square feet of liquid flat plate collectors, a 2500 gallon insulated vertical steel storage tank, two heat exchangers and pumps and controls. The system was designed to supply approximately 74 percent of the total hot water load.

15495 **(DOE/R5/10148—2) Solar passive ceiling system. Final report.** Schneider, A.R. (Dwyer-Mercer County District Public Library, Celina, OH (USA)). 1980. Contract FG02-79R510148. 75p. NTIS, PC A04/MF A01.

The construction of a 1200 square foot building, with full basement, built to be used as a branch library in a rural area is described. The primary heating source is a passive solar system consisting of a south facing window system. The system consists of: a set of windows located in the south facing wall only, composed of double glazed units; a set of reflectors mounted in each window which reflects sunlight up to the ceiling (the reflectors are similar to venetian blinds); a storage area in the ceiling which absorbs the heat from the reflected sunlight and stores it in foil salt pouches laid in the ceiling; and an automated curtain which automatically covers and uncovers the south facing window system. The system is totally passive and uses no blowers, pumps or other active types of heat distribution equipment. The building contains a basement which is normally not heated, and the north facing wall is bermed four feet high around the north side.

15496 **(P—400-80-034) Potential market for solar equipment among California homeowners. Final report.** Leonard-Barton, D.; Rogers, E.M.; Avi-Itzhak, T.; Patel, I. (Stanford Univ., CA (USA). Inst. for Communication Research). Jul 1980. 216p. California Energy Commission, Sacramento.

The purpose of the research reported herein is to determine what is the nature of the potential market for residential solar equipment among California homeowners. The present study of 812 California homeowners builds upon a pilot study of 111 solar equipment owners and 104 of their nearby neighbors (Rogers and others, 1979). At present, seven out of eight California homeowners are at least aware of residential users in solar energy, but the majority have little current intention to purchase. About one-fourth knows someone who owns a solar residential system. The number of solar owners with whom homeowners are acquainted is a crucial influence on their intention to purchase solar equipment themselves. Other important predictors of intent to buy are: the number of years respondents believe it will take for solar equipment to pay for itself, attitudes about the viability of residential solar equipment, the extent to which respondents tend towards a lifestyle of voluntary simplicity, and the homeowners' socio-economic status. These five variables predict 46% of the total variance in interest and intention to puchase residential solar equipment.

15497 (SAND—80-1666, pp 15-22) **Solar enhanced oil recovery: a review of current activities and progress.** Bergeron, K.D. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

For more than 15 years, the production of many US oil fields has been enhanced by the injection of huge quantities of steam, which permeates the reservoir, heating the heavy crude and reducing its viscosity. The idea behind Solar Enhanced Oil Recovery (SEOR) is simply that concentrating solar collectors are used instead of fossl-fired boilers to generate the steam. Recently, SEOR has received considerable attention as a favorable application of solar energy and as a potential early market opportunity. Current activities and progress are reviewed. (WHK)

15498 (SAND—80-1666, pp 79-85) **Overview of solar industrial process heat.** Bergeron, K.D. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Topics discussed include industrial process heat as an energy market sector, the Department of Energy's solar IPH field test program, and Sandia's on-site materials exposure program. (WHK)

15499 (SAND—80-1666, pp 87-92) **Modular industrial solar retrofit project (MISR).** Alvis, R.L. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The Department of Energy (DOE) has supported solar thermal energy development since the oil embargo. Parabolic trough type solar collectors were one of the first approaches tried, and much development progress has occurred. Several system experiments have been conducted to obtain realistic development status, and operational experience has been gained from them. The MISR Project represents a major thrust by DOE to bring solar thermal energy using line-focus solar collectors to commercial readiness. The project and the approach being used to assure success in obtaining commercial readiness are described.

15500 **(SERI/TP—632-1113) Operation and design of selected industrial process heat field tests.** Kearney, D.W. (Solar Energy Research Inst., Golden, CO (USA)). Feb 1981. Contract AC02-77CH00178. 8p. (CONF-801203—7). NTIS, PC A02/MF A01.

From National conference on renewable energy technologies; Honolulu, HI, USA (7 Dec 1980).

The DOE program of solar industrial process heat field tests has shown solar energy to be compatible with numerous industrial needs. Both the operational projects and the detailed designs of systems that are not yet operational have resulted in valuable insights into design and hardware practice. Typical of these insights are the experiences discussed for the four projects reviewed. Future solar IPH systems should benefit greatly not only from the availability of present information, but also from the wealth of operating experience from projects due to start up in 1981.

15501 **(SOLAR/0023—81/40) Performance of active solar space-cooling systems: 1980 cooling season.** Blum, D.; Frock, S.; Logee, T.; Missal, D.; Wetzel, P. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). 1980. Contract AC01-79CS30027. 155p. NTIS, PC A08/MF A01.

A detailed analysis of the solar absorption cooling process as represented by the NSDN system is presented. There is comprehensive data on eight solar cooling systems in the NSDN. Among these eight systems solar cooling by an absorption chiller is not a cost effective method to use solar heat. This statement is substantiated by careful analysis of each subsystem and equipment component. Good designs and operating procedures are identified. The problems which reduce cost effectiveness are pointed out. There are specific suggestions for improvements. Finally, there is a comparison of solar cooling by absorption chilling and using photovoltaic cells.

15502 **(TAC-STC—80-004) Solar thermal components. Quarterly update, October-December 1980.** (New Mexico Univ., Albuquerque (USA). Technology Application Center). Jan 1981. 192p. Univ. of New Mexico., Albuquerque.

This annotated bibliography covers the following subjects: material properties, flat plate collectors, concentrating collectors, heat pumps, coolers and dehumidifiers, heat exchangers, solar ponds, distillation, agricultural and industrial process heat, and irrigation pumps. (MHR)

15503 **(UCRL—84610(Rev.1)) Solar coal gasification: plant design and economics.** Aiman, W.R.; Thorsness, C.B.; Gregg, D.W. (Lawrence Livermore National Lab., CA (USA)). 23 Feb 1981. Contract W-7405-ENG-48. 12p. (CONF-801104—6(Rev.1)). NTIS, PC A02/MF A01.

From 73. annual meeting of the American Institute of Chemical Engineers; Chicago, IL, USA (12 Nov 1980).

A plant design has been layed out in which focused solar energy is used to gasify coal and the resulting synthesis gas is converted into pipeline gas. The overall performance of the plant and its economics are compared to a similar Lurgi plant. The advantage of the solar coal gasification (SCG) method is conservation of coal, 40% more product can be produced from a given amount of coal. The primary detriment of SCG is the 8 h/day operation; which leads to a higher plant investment for a given annual production. This factor is twice as important as the cost of the heliostat field. Thus, operating costs are lower but capital costs are higher. In the future, as coal costs increase relative to investment costs; the SCG plant will become more economical than the Lurgi plant.

15504 **Hot water tank for use with a combination of solar energy and heat-pump desuperheating.** Andrews, J.W. (to Dept. of Energy). US Patent Application 163,449. 25 Jun 1980. 14p.

A water heater or system is described which includes a hot water tank having disposed therein a movable baffle to function as a barrier between the incoming volume of cold water entering the tank and the volume of heated water entering the tank which is heated by the circulation of the cold water through a solar collector and/or a desuperheater of a heat pump so as to optimize the manner in which heat is imparted to the water in accordance to the demand on the water heater or system. A supplemental heater is also provided and it is connected so as to supplement the heating of the water in the event that the solar collector and/or desuperheater cannot impart all of the desired heat input into the water.

15505 **(SOLAR/1081—80/50) Solar project description for Summerwood Associates' condominium residences (G), Old Saybrook, Connecticut.** (Department of Housing and Urban Development, Washington, DC (USA)). [nd]. Contract AB01-76CS31020. 59p. NTIS, PC A04/MF A01.

The Summerwood G (Grant H-8312) site is a rowhouse residence in Old Saybrook, Connecticut. The home has approximately 1320 square feet of conditioned space. Solar energy is used for space heating and preheating domestic hot water (DHW). The solar energy system has a pyramidal optics collector system consisting of a 448 square feet solar skylight and a 47-inch wide by 340-inch long absorber plate mounted in the attic. Fixed reflectors constitute three sides of the pyramid. A clock-controlled moving reflector flap on the other (bottom) side varies the collector aperture from a minimum of 162 square feet in June to a maximum of 352 square feet in December. The collector faces 28 degrees east of south with the absolute set at an angle of 60 degrees to the horizontal. Water is the transfer medium that delivers solar energy from the collector array to storage and from storage to the space heating and DHW loads. Drain-down provides collector freeze protection. Solar energy is stored in the crawl space in a 600-gallon poured concrete insulated tank. Solar heated water is supplied to a liquid-to-air heat exchanger within the space heating duct and to a heat pump for water-to-air operation. A closed heat transfer loop between the solar storage tank and a 120-gallon DHW tank provide solar energy to the DHW supply.

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 15484, 15499, 15502

15506 **(DOE/CS/34099—T2) Cost-effective solar collectors using heat pipes. Interim progress report No. 2, April 1978-September 1978.** Ernst, D.M. (Thermocore, Inc., Leola, PA (USA)). 1978. Contract AC04-77CS34099. 72p. NTIS, PC A04/MF A01.

Heat pipe fluid-vessel combinations continued to be life tested at design and stagnation conditions for time periods exceeding 14,000 hours. Additional testing was carried out at the lower end of the environment temperature range by freeze-thaw testing of several water heat pipes. Additional fluids search work resulted in developing a procedure to purify trimethylborate. Eight trimethylborate heat pipes were fabricated and installed in a modified GE TC-100 solar panel. Solar performance tests were performed on the heat pipe collector and a standard TC-100 collector. Heat pipe collector performance exceeded 90% of the TC-100. A source of water compatible steel, NP454, was identified as was an experimental tubing manufacturer. The current availability of NP454 and the successful demonstration of antifreeze mechanisms lays the ground work for testing a heat pipe collector using water heat pipes.

15507 **(DOE/JPL—1060-40) Cost/performance of solar reflective surfaces for parabolic dish concentrators.** Bouquet, F. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Jul 1980. Contract AI01-77ET20401. 55p. (JPL-PUB—81-2). NTIS, PC A04/MF A01.

Materials for highly reflective surfaces for use in parabolic dish solar concentrators are discussed. Some important factors concerning performance of the mirrors are summarized, and typical costs are treated briefly. Although much of the data given are general and applicable to flat or curved solar reflectors, capital investment cost/performance ratios for various materials are computed specifically for the double curvature parabolic concentrators using a mathematical model. The results are given in terms of initial investment cost for reflective surfaces per thermal kilowatt delivered to the receiver cavity for various operating temperatures from 400 to 1400°C. Although second-surface glass mirrors are emphasized, first-surface, chemically brightened and anodized aluminum surfaces as well as second-surface, metallized polymeric films are treated. Conventional glass mirrors have the lowest cost/performance ratios, followed closely by aluminum reflectors. Also, ranges in the data due to uncertainties in cost and mirror reflectance factors are given.

15508 **(EUR—6799-DE) High performance collector for small solar energy installations. Final report.** Obermayr, E.; Molt, W.; Schneller, D.; Speidel, K. (Dornier-System G.m.b.H., Friedrichshafen (Germany, F.R.)). 1980. 100p. (In German). European Community Information Service, Washington, DC.

The aim of the project was to develop collectors of high efficiency for use in small solar energy installations (for solar cooling processes and solar processes for generating mechanical or electric energy). A series of preliminary investigations and laboratory experiments were undertaken to establish the basis for the structural design of the collectors. As a result of this work, the decision was taken in this particular case to design flat vacuum collectors instead of opting for the alternative solution of concentration collectors. The type chosen differs from existing types in that the working medium is directly vaporized in the collector; the collector, therefore, acts simultaneously as vaporizer. Several designs were produced and investigated; prototypes of direct-vaporizing collectors were built and tested. The results confirmed the theoretical calculations. An efficiency of 40 to 50% was obtained for the operating range of 130 to 150°C.

15509 **(HNEI—80-08) Preliminary assessment of solar salinity-gradient ponds applications in Hawaii.** Bathen, K.H.; Gupta, S. (Hawaii Univ., Manoa (USA). Hawaii Natural Energy Inst.). Oct 1980. 64p. HNEI Univ. of Hawaii, Monoa, Honolulu.

The intent of this brief exploratory work was to examine the application of salinity gradient solar ponds in Hawaii. These highly

stratified solar ponds, a few meters deep, can provide potentially significant amounts of heat or power for research, aquaculture, resort, business, agricultural, and residential uses. Following this initial work it is anticipated that additional technical background, application techniques, construction criteria, maintenance criteria, and approximate costs will be determined for several typical applications in a detailed followup study effort. It is also proposed that a scheme for a test-prototype pond will be outlined for continuing the work, with the eventual objective to construct a working laboratory model prior to a field application model pond. This preliminary work was completed in two months. It considered the following initial objectives prior to the more rigorous work to follow: (1) assemble and update pertinent historical literature as available, within the brief funding period; (2) assembly of insolation data for Hawaii, electrical loads and related information for typical pond applications on the Island of Oahu; (3) evaluation of the needs of sample prototype solar ponds; and (4) attempt to preliminarily determine the viability of the concept of salinity gradient solar ponds for the Hawaiian environment. Three typical pond applications were selected: a residential, commercial, and hotel establishment use. The viability of each use was identified and some of the technical criteria associated with each discussed.

15510 **(JPL—400-98) Parabolic-dish concentrator designs and concepts.** Beveridge, B. (comp.). (Jet Propulsion Lab., Pasadena, CA (USA)). Dec 1980. Contract AT01-76ET20446. 31p. NTIS, PC A03/MF A01.

This technical summary consolidates descriptions of all known parabolic dish concentrator designs and advanced parabolic dish concentrator concepts for those investigating solar thermal power systems. The emphasis is on the concentrator subsystem; however, available information about the receiver and thermal transport subsystems is also provided. The first section of this summary describes ten known dish system designs, currently in production or under detailed development. The second section includes descriptions of the advanced concepts, which are approaching the full conceptualization and design stage. These designs and concepts represent potential commercial units. The technical information provided relates only to the design or concept of the parabolic dishes. It does not include, either expressly or implicitly, any performance characteristics of the component or module hardware. (WHK)

15511 **(MLM—2812(OP)) Observations regarding materials and site preparation for salt-gradient solar ponds.** Harris, M.J.; Etter, D.E.; Wittenberg, L.J. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 4p. (CONF-810509—2). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

Experiences gained during the past two years at the largest solar pond in the US are presented. Approximately one year after the pond was completed, the random failures of portions of the factory-fabricated seams in the plastic liner were detected. In addition, excessive corrosion was evident in the copper tube heat exchanger which was submerged in the pond. Based upon these experiences, recommendations are made regarding the preparation of a solar pond site and regarding the materials and their fabrication into pond liners and heat exchangers.

15512 **(SAND—80-1666) Line-focus solar thermal energy technology development. A seminar for industry.** Champion, R.L. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 482p. (CONF-800955—). NTIS, PC A21/MF A01.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Separate abstracts were prepared for 45 of the 49 papers presented. Four papers were previously entered into the data base. (WHK)

15513 (SAND—80-1666, pp 9-13) **Overview of line-focus concentrator program.** Dugan, V.L. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The Line-Focus Concentrator Program has emphasized the development and dissemination of solar technology in which the reflected sunlight is concentrated on a linear or line receiver. The primary objective of this program has been to assist in establishing viable solar resource options and a technological understanding which allows public decisions with high confidence. The strategy for accomplishing this objective and for promoting the commercialization of line-focus concentrators involves improving the performance and the reliability of hardware at the component, subsystem, and systems levels; reducing the cost associated with installation of the systems; and allowing opportunities for increasing the production levels so that mass production technology can become a reality. A brief synopsis of activities and accomplishments relative to these strategies in fiscal 1980 is presented.

15514 (SAND—80-1666, pp 93-113) **Midtemperature solar systems test facility (MSSTF).** Workhoven, R.M. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The Experimental Systems Operations Division of Sandia National Laboratories in Albuquerque, New Mexico, operates the MSSTF. Work is sponsored by the Solar Thermal Program under the Division of Solar Thermal Energy Systems for the US Department of Energy (DOE). The MSSTF is primarily dedicated to support of the following projects and activities: (1) line focus component and subsystem development; (2) line focus system/applications development; (3) commercial products and development activities; (4) thermal storage development; and (5) other development requiring unique capabilities, experience, etc. The MSSTF is described, and some recent test results are presented. (WHK)

15515 (SAND—80-1666, pp 117-120) **Crosbyton solar power project: review of system hardware service.** Reichert, J.D. (Texas Tech Univ., Lubbock). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Problems encountered in operation of the ADVS (Analog Design Verification System), the largest single solar collector ever built, are discussed. The ADVS has operated for seven months. (WHK)

15516 (SAND—80-1666, pp 121-127) **Development of the T-2100 line-focus solar collector.** Hutchison, G. (Solar Kinetics, Inc., Dallas, TX). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The design, specifications, and installation procedures for the T-2100 parabolic trough collector are given. The T-2100 collector has a 21 foot aperture. Parameters of the T-2100 collector are compared to parameters of the T-700 collector. (WHK)

15517 (SAND—80-1666, pp 129-136) **Predicted performance of line-focusing, concentrating solar collectors with potential for use in industrial process heat applications.** Harrison, T.D. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Sandia National Laboratories (SNLA) is conducting a program to provide accurate predictions of the thermal performance of line-focusing solar collectors that have potential for use in producing industrial process heat (IPH). The program is discussed. Thermal performance predictions have been completed for 14 types of commercially available line-focusing collectors at 5 locations for 4 different collector output temperatures. The overall error in these predictions is estimated to be less than 5%. The TMY tapes provide typical long-term weather data, but short-term deviations are to be expected. (WHK)

15518 (SAND—80-1666, pp 137-143) **Design of collector subsystem piping layouts.** Morton, R.E. (Jacobs Engineering Group, Pasadena, CA). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Review of current designs show that the process piping systems in solar collector arrays are being built around design criteria

long established as acceptable by process industries. Although these criteria are known to be conservative when applied to solar collector fields, designers are still forced to use them because guidelines do not exist yet for solar applications. The use of conservative process piping design criteria undoubtedly increases capital and operating costs when used without consideration for the special nature of solar energy fields. In early 1979, Sandia Laboratories commissioned Jacobs Engineering Group to study the piping criteria in depth as they apply to the design of solar field piping layouts. Field layout; optimum insulation type and thickness; method and frequency of pipe support; ΔT string length; pump type; driver type and many other related factors were to be studied. The long range goal of these studies is to develop special guidelines tailored to facilitate design of modular solar piping systems. The initial design studies have been performed on a 50 thousand square foot solar collector field layout. As a result of these studies, recommendations for configuration; ΔT string length; header piping profile; and insulation material and thickness have been developed. The insulation recommendations can be applied to the design of any size solar array because it was possible to decouple the insulation study from the piping study. The other recommendations, however, apply strictly to the design of the 50 thousand square foot E-W collector array. Future studies should be made to determine the need to modify the piping recommendations for modular collector arrays which are larger or smaller than the one studied.

15519 (SAND—80-1666, pp 145-158) **Design of collector subsystem piping layout II. Evaluation and extension of standard engineering design techniques.** Sharp, J. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The thermal transport piping is one of the main components of a parabolic trough collector field. In designing the collector field piping, one must consider the effects of the layout on collector performance, thermal losses within the field, electrical energy for pumping, and the capital and installation costs of the piping network. For proper field design one should strive to minimize the total annual operation cost reslting from all of these factors. Jacobs Engineering Group has developed a piping layout design using these ideas for a specific collector field located in Albuquerque, New Mexico. The objectives of the study described were to: (1) verify the design techniques used by Jacobs, and (2) develop the tools needed to extend the analysis of piping field layouts to parameter values not evaluated by Jacobs. Of particular interest were the Jacobs design criteria of decoupling the thermal and electrical parasitics and sizing field piping to provide equal fluid head loss through each manifold pipe size. The generalized computer optimization techniques developed as a part of this study confirmed these and other Jacobs design techniques.

15520 (SAND—80-1666, pp 159-167) **Subsystem collector piping heat losses.** Harrigan, R.W. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Heat loss in piping manifolds is a principal parasitic decreasing overall thermal efficiency of parabolic trough collector fields. The effect of collector field components such as valves, pipe anchors and receiver tubes on daily integrated field heat loss is being quantitatively evaluated in the Midtemperature Solar Test Facility (MSTF) located in Albuquerque, New Mexico at Sandia National Laboratories (SNLA). The objective of these tests is to generate the data needed to allow proper trade-off evaluations of collector field heat loss and such effects as intercollector shadowing. Additionally, knowledge of heat loss from collector field components is imperative for field designers to be able to layout collector fields with the proper balance between the desire for enhanced fluid control and minimum valving to reduce thermal losses. Progress is reported. (WHK)

15521 (SAND—80-1666, pp 169-179) **Fluid control for parabolic trough collectors: simulation studies and test results.** Schindwolf, R. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Temperature control in a parabolic trough collector field for electric power production is studied. Results of a computer simulation study of the fluid control system as well as test results obtained at the Midtemperature Solar System Test Facility (MSSTF) are presented. The results of the simulation study show that a simple proportional control algorithm operating a motor driven flow-control valve on each collector row will achieve the required temperature control for the majority of transient conditions. Certain partial cloud cover situations can result in overtemperatures, but the addition of a simple override control operating off a midrow temperature measurement will correct the problem. The results obtained from the MSSTF tests appeared to confirm the simulation study conclusions. Several discrepancies from expected performance were noted, but these have been attributed to test configuration peculiarities. (WHK)

15522 (SAND—80-1666, pp 181-187) **Subsystem design handbook.** Harrigan, R.W. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

In order to progress towards the near-term commercialization of solar energy, an extensive parabolic trough development program is underway which seeks to provide the technology readiness needed to support commercialization. This subsystem design handbook is being prepared as part of that effort. Handbook design procedures are needed to help instill reliability of design and lower costs resultant from custom designing. Development of standard design procedures is an evolutionary process and this project attempts to initiate that evolution. The goal of this handbook is to provide easily used design techniques which will allow the execution of preliminary designs leading to the construction of solar thermal parabolic trough systems. In an effort to outline the contents, several areas have been selected to illustrate the type of material found in the handbook. (WHK)

15523 (SAND—80-1666, pp 189-203) **Solar collector cleaning study.** Larsen, L.M.; Freese, J.M. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Continuing studies at Sandia National Laboratories, Albuquerque (SNLA) on heliostats have indicted that degradation in reflectance does occur with time as a result of weathering (no cleaning). Inverted stow at night reduces the accumulation of this weathering soil, but it still progresses with time. The same results have been obtained on sample mirrors that have been exposed to Albuquerque's ambient atmospheric conditions for 2.5 years. The purpose of this study is to investigate a matrix of cleaning parameters, which include cleaning materials, sheeting agents, cleaning frequency, water pressure, water treatments, etc., and to identify good candidates. A longer term effort is aimed at developing cost-effective cleaning equipment, cleaning materials, and techniques for full scale systems. Progress is reported.

15524 (SAND—80-1666, pp 215-229) **Thermooptical considerations in trough design.** Treadwell, G.W. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Parabolic trough collector geometric configurations are significantly influenced by thermooptical considerations. From an elementary standpoint, the collector performance is determined by calculating the optical energy captured by the geometry and subtracting the thermal losses. Each of those features which influence optical capture and thermal losses are described. For a proper geometric design, it is shown that optical considerations are more dominant than thermal considerations.

15525 (SAND—80-1666, pp 231-245) **Wind load definition for line-focus concentrating solar collectors.** Randall, D.E. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

A multiplicity of experimental projects has demonstrated the technological feasibility of utilizing solar energy for mechanical and electrical power in addition to direct thermal energy requirements

for applications in the low to intermediate temperature regime. However, the current economic characteristics of solar thermal energy sources preclude their widespread application and the commercialization of this technology through the private economic sector. One of the primary factors currently controlling this situation is the total installed cost of these energy systems. A prime contributing factor to this cost lies in the collector rigidity together with support structure and foundation requirements neoessary to withstand adverse wind loading. A procedure is outlined to enable the designer to define peak wind loads which might be anticipated during the operational lifetime of a solar collector array. This procedure is intended to provide the information necessary to the preparation of economical collector and foundation design characteristics while simultaneously meeting the necessary safety and reliability constraints for line-focus concentrating collector arrays.

15526 (SAND—80-1666, pp 247-253) **Foundations for line focusing solar collectors.** Auld, H.E. (Higgins, Auld and Associates, Inc., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

A line focusing solar collector system is subject to aerodynamic and mechanical (e.g., torgue from the drive mechanism) forces which reslt in fairly unique foundation loading conditions. These forces can be resolved into a single equivalent eccentric inclined load which is applied to the foundation-pylon system. The design of foundations for the given loading environment is not straightforward and there are limited field test data available which is immediately applicable. Calculation methods for foundations are discussed, and two field test programs to determine the capacity of reinforced concrete cylindrical cast-in-place piers which are directly applicable to the design of foundations for line focusing solar collector systems are described. (WHK)

15527 (SAND—80-1666, pp 255-263) **Pylons.** Reed, T.H. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The component of the line focus collector which mounts the reflector structures and secures them to a suitable foundation is termed the pylon. The pylons also include bearings for rotation of the reflectors by the tracking drive system. When multiple collectors are combined end-to-end into a drive string row, the pylons at different positions provide certain functions which influence their design. The design of the pylons is examined. The major design factors are defined and discussed.

15528 (SAND—80-1666, pp 265-271) **Initial parabolic trough design and parametric evaluation.** Reuter, R.C. Jr. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

A parabolic trough is that portion of a parabolic, line focusing collector system which provides the correct optical shape for the reflective surface, maintains this shape to within acceptable tolerances during operation and protects the reflective surface during non-operating periods. In engineering terms this means that stresses and deflections experienced by the trough and reflector must remain below specified levels under various gravity, wind and thermal load environments and, at the same time, physical properties of the trough, such as size and weight, must be compatible with overll design objectives. With preliminary guidelines such as shape (parbola definition), aperture, deflection allowance under moderate wind (operating conditions), and no structural failure up to a specified wind speed (survival conditions), the designer proceeds to define construction concepts and materials for the trough. This task is not easy at first because of the many construction concepts (or designs) possible and the many materials available for each concept. The initial steps taken at Sandia to eliminate those materials and designs which have little or no chance for success, and to provide preliminary guidance for design of those for which engineering development appears viable are outlined.

15529 (SAND—80-1666, pp 273-279) **Sheet metal reflector structures.** Champion, R.L. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Sheet metal, steel sheet metal, represents a low cost readily available material which has been incorporated into an endless array of products using high volume production techniques. The adaptation of sheet steel technology to solar reflector panels appears very appropriate, but there remain questions regarding: (1) the accuracy of stamped sheet metal panels; (2) integration of the reflector material into the structure; (3) environmental protection of the steel for long life; and (4) integration of the reflector/structure with the supporting torque tube. The design requirements and material problems which might be encountered with sheet metal reflector structures are described. (WHK)

15530 (SAND—80-1666, pp 281-290) **Sheet metal trough reflector/structure.** Biester, A.W. (Budd Co. Tech. Center, Fort Washington, PA). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

In the search for a parabolic trough reflector structure which will be efficient, low cost, durable and suitable for mass production, many designs have been developed. The automobile industry, which is considered the model for high production of structural shapes, has long used sheet metal stampings to provide low cost structures. How automobile production technology has been adapted to the development and prototype production of parabolic trough reflector structures is described.

15531 (SAND—80-1666, pp 291-296) **Sheet molding compound (SMC) reflector/structure.** Champion, R.L. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Molding with sheet molding compound (SMC) is a potential fabrication technology for the manufacture of parabolic trough reflector structures. SMC is a polyester resin material with chopped fiberglass reinforcement along with appropriate fillers and modifiers. Parts of SMC are typically molded at 300°F and 600 to 1000 psi in a 3 to 5 minute cycle times. SMC molding is a semi high volume production process. It offers potential for low cost. Early investigations of trough panels molded of SMC indicated that the slope error accuracy requirements, as well as stability requirements could be met. Analyses indicated that structural requirements could be met. With this promise, a second development effort was undertaken to conjunction with Haveg Industries, Santa Fe Springs, California, to investigate the possibility of molding a silvered glass mirror into the panel as an integral part; this effort is described. (WHK)

15532 (SAND—80-1666, pp 297-305) **Development effort of sheet molding compound (SMC) parabolic trough panels.** Kirsch, P.A. (Budd Co. Tech. Center, Ft. Washington, PA). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The present development effort of sheet molding compound (SMC) parabolic trough panels is to develop molding techniques, provide information and demonstrate technical feasibility in the fabrication of SMC solar panels. The main thrust of the program is to successfully mold-in a mirrored glass sheet with the SMC, thus eliminating subsequent mirror to structure bonding operations and providing a good environmental seal for the silver coating on the molded surface of the glass. Co-molding of the mirror in the SMC also offers considerable potential in reducing the overall cost of such components. Problems encountered in the development program as well as the general progress of the program from initial panel design through to the molding of the trough solar panels are discussed. (WHK)

15533 (SAND—80-1666, pp 307-314) **Honeycomb reflector/structure.** McDowell, J.W. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The Engineering Prototype Trough (EPT) was an earlier attempt to use a honeycomb panel fabrication for a reflector structure. It was 75 3/4" across and 20' long, or 2 m x 6.1 m. With mir-

rored glass added to this structure, it gave an enticing peak performance of 60% at 316°C. However, this was achieved by blocking out 4" bands along each rim in order to eliminate zones of excessive slope error. This error was induced by a fabrication technique. Yet the whole concept appeared promising and had the potential for mass production if processing techniques were revised. The design of an improved honeycomb trough with a 2 m x 6 m aperature and a 19.01 inch focal length is described. (WHK)

15534 (SAND—80-1666, pp 315-321) **Glass laminate reflector/structure.** Martin, S.B. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

A straightforward concept for a parabolic trough solar collector utilizes thermally formed and laminated glass mirrors which are supported by a steel structure. Automotive windshield technology demonstrates that glass can be thermally formed to shape and laminated using high volume production techniques. Relative to potential application to solar collectors, laminated mirrors for heliostats at the CRTF have indicated excellent protection of the silver from the environment. Metal stamping technology appears applicable for fabrication of the support structure because of good contour accuracy and potentially low costs in production. The concept is described, and evaluation results are presented on prototype thermally formed glass mirrors. Design, fabrication, and assembly considerations for the concept are discussed.

15535 (SAND—80-1666, pp 323-326) **Thermally formed parabolic glass panels.** Lewis, I.E. (Ford Aerospace and Communications Corp., Palo Alto, CA). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

By far the most important barrier to the development of industrial solar energy apparatus on a large scale is the adaptibility of the solar hardware to high volume production techniques and processes. Many of the collectors available today use reflector surfaces that are not durable enough to withstand the rigors of day-in, day-out operation in changing weather conditions over a significant number of years. It is today's concensus of those working in the collector field that the only suitable surface for a truly long-life solar concentrator is glass, curved as required to form the overall concentrator surface. To date there has been little development of a production scheme for forming flat glass into the curves needed to fashion a solar trough concentrator. Certain manufacturing technology (the adaptation of automotive windshield technology) applicable to the cost-effective production of formed glass panels for use in parabolic trough line focus concentrating solar collectors is discussed. (WHK)

15536 (SAND—80-1666, pp 327-335) **Analytical and experimental studies of some parabolic line concentrator design concepts.** Koteras, J.R.; Lewis, B.A. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The finite element method is being used as part of the evaluation process for prototypical design concepts for parabolic line concentrators. The finite element studies are used to calculate stresses in line concentrators arising from various load conditions and to examine optical performance. The analysis procedure which is being used is discussed. Also, some experimental work being carried out in conjunction with the analyses to evaluate the numerical models are discussed.

15537 (SAND—80-1666, pp 337-344) **Integrated solar field control systems.** Ahrens, B. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Safe, high performance operation of a concentrating trough solar collector field requires that three control functions be accomplished. The troughs must be driven to stay in focus throughout the day. The flow of coolant must be controlled to maintain a desired output temperature, and, since the troughs are capable of heating their receivers far past the point of destruction if cooling is insufficient, safeguards must be provided to ensure that the system does not destroy itself in the event of low fluid flow. Additionally, information on the status of the field should be provided to an operator or service technician. A control system developed by Honeywell to perform these control functions is described. (WHK)

15538 (SAND—80-1666, pp 345-350) **Sandia solar collector field control system detailed design review.** Williams, J.; Steen, R. (Technology and Strategy Center, Roseville, MN). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

An improved line-focus solar collector control system based on the Zilog-Z8 microprocessor is described. The system is aimed at providing cost-effective, and reliable sun tracking and control. The system provides the required control and safety features while minimizing the all-important costs for installation and operation. The control system design is compatible with the solar field modular concept and is easily extended to a larger field of multiple solar field modules. (WHK)

15539 (SAND—80-1666, pp 351-357) **Drive system for line-focus collectors.** Randall, R.A. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

In any collector system that tracks the sun, a drive mechanism is required to move or rotate parts of the system in order to maintain focus on the receiver during operation, and to move the assembly to and from the stowed condition. Stowage is required to preclude inadvertent focusing and to minimize mirror contamination. Such a drive system must provide enough force, or torque, to operate the system under all expected wind conditions, have sufficient precision of operation for accurate tracking, and have sufficient speed to provide stowage in a reasonably short time. Drive system design goals, torque loads, system design, and a drive tester are discussed. (WHK)

15540 (SAND—80-1666, pp 358-368) **Non-evacuated receivers.** Treadwell, G. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

A properly designed evacuated-annulus receiver can, in theory, provide a performance enhancement of about 10%. However, the construction complexity and attendant fabrication and replacement cost limits the desirability of developing such a design for the immediate future. Non-evacuated receivers can be developed and adopted in a much shorter time period; their basic design alternatives are described. The results of the design selections are described, and results of performance tests are presented. (WHK)

15541 (SAND—80-1666, pp 369-376) **Passively evacuated receivers.** Torkelson, L.E. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Evacuated receivers for line-focus solar collectors contain a vacuum between their glass envelope and absorber tube. A passively evacuated receiver is a hermetically sealed assembly which maintains its vacuum without the assistance of a vacuum pump. An analytical comparison of the heat loss from a passively evacuated receiver and non-evacuated receiver is presented. These results are compared to experimental measurements made in the laboratory. The design and construction of the laboratory model and those placed on parabolic troughs at the Midtemperature Solar System Test Facility (MSSTF) are discussed. Lessons learned during the construction and initial testing at the MSSTF are presented along with a discussion of the test data available to date.

15542 (SAND—80-1666, pp 377-386) **Insulated metal hose for tracking receiver application.** Boyd, W.E. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Heat transfer fluid must be conveyed between the solar receiver and the field distribution manifold in a field of parabolic

trough solar collectors. The devices to accomplish this task must: accommodate motions of collector, receiver, and manifold; minimize pressure drop; conserve collected energy; and minimize cost. The motions to be accommodated, and the mechanisms considered for each are: (A) collector rotation - by flexible hose or rotary joint; (B) receiver thermal expansion - flexible hose or linear bellows device; and (C) manifold thermal expansion - flexible hose or linear bellows device. Since a rotary joint approach requires three discrete components to satisfy A, B, and C, and since the hose is the common element in A, B, and C, a single hose approach seems the obvious choice to minimize cost. The purposes of this study are to: (1) describe the interface requirements, (2) describe the conceptual design of an insulated metal hose, (3) describe some hose deployment concepts, and (4) describe a hose test program. (WHK)

15543 (SAND—80-1666, pp 398-408) **Glass fiber reinforced concrete for parabolic troughs.** Slemmons, A.J.; Ploeger, D.W. (SRI International, Menlo Park, CA). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The program objective is to investigate the use of GRC as a material for the construction of heliostats and parabolic trough collectors. Initial efforts have emphasized the utilization and suitability of GRC for parabolic trough collectors and the development of a low-cost design. GRC material properties are being determined with various sands and sand/cement ratios. The construction of a single 2 m x 6 m parabolic trough collector module is planned. It will be tested at Sandia's Solar Thermal Test Facility at Albuquerque. Progress is reported. (WHK)

15544 (SAND—80-1666, pp 409-417) **Material design considerations for silvered glass mirrors.** Clark, N.H. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

The material design considerations for using silvered glass mirrors in solar concentrating collectors are outlined. Curved glass mirror fabrication is discussed, and the optical, mechanical, and environmental performance of glass mirrors is reviewed.

15545 (SAND—80-1666, pp 428-434) **Materials compatibility/life predictions.** Clark, N. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Studies of the economics of solar energy suggest that system lifetimes of 10 to 20 years are required. Since solar system and component technologies are in relatively early stages of development, accelerated aging methods are required to make reliable life predictions. Traditionally, testing has been done using a combined temperature, humidity cycle of 2 hours at low temperature/low humidity, 2 hours transition, 2 hours at high temperature/high humidity, 2 hours transition. Although this method has produced failures in systems, interpretation of the failure in terms of cause is very difficult since we have at a minimum 3 effects - temperature/humidity/mechanical cycling stress-operating simultaneously. In some cases, especially in diffusion controlled processes, failures can occur in such testing that do not appear in actual application. In order to improve accelerated aging techniques, Sandia National Laboratories has initiated a project to predict lifetimes of solar collector components based on an approach developed by Gillen and Mead of Sandia National Laboratories. This method deals with identification of material incompatibilities and failure modes folowed by an Arrhenius type kinetic analysis to predict lifetimes. The method is briefly described, and an experimental plan which will be applied to parabolic trough solar collector/reflector/structures is discussed.

15546 (SAND—80-1666, pp 448-451) **Optical testing of line-focus solar concentration by laser raytrace.** Hughes, R.L. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

If a laser is mounted on a rail so that its ray remains parallel to the optical axis of a parabola, the offset of the reflected beam from the intended focus is a measure of the quality of a collector. The Laser Ray Trace Tester developed at Sandia Laboratories implements this simple geometry. The Laser Ray Trace Tester has a helium-neon laser suspended vertically in a gimbaled mount on a carriage which moves along an overhead gantry. The collector to be tested is mounted with its focal line at a right angle to the gantry axis on a movable table on the floor. A 4-inch long linear detector is mounted on a rotating stage at the collector focal line so that any deviation of the reflected light beam is measured along the detector. The stage rotation is controlled so that the detector is always normal to the reflected beam from the collector. A computer controls the motion of the system, reads the beam position on the detector, stores the data for each scan, reduces the data into slope error at each position, and plots the slope error curve for each scan. The collector is scanned in raster fashion from rim-to-rim and from end-to end. (WHK)

15547 (SAND—80-1666, pp 452-458) **Field laser ray trace tester.** Hansche, B.D. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Ray trace testing of a parabolic trough solar reflector consists of shining a ray of light on the reflector, and measuring its angle of reflection by detecting the position of the reflected ray as it strikes a surface - usually a detector of some sort. A laser is usually used as a convenient source of a light ray. In the laboratory ray trace tester (LRTT) the input ray is maintained parallel to the parabola focal plane, which causes the reflected ray to pass somewhere near the theoretical focal line. This method has the advantages of minimizing necessary detector size, and testing the device in a manner which is optically similar to its intended use. The LRTT is briefly described.

15548 (SAND—80-1666, pp 459-466) **Solar profile intensity gauge for receiver tube subsystem optimization in concentrating collectors.** Semmens, M.G. (BDM Corp., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Significant improvements in the performance of solar thermal collectors and photovoltaic concentration collectors have been demonstrated with alternative receiver tube configuration designs. Optimal design for each collector produced by the variety of manufacturers involved in solar thermal or solar photovoltaic systems needs a quick and efficient means of providing the empirical data necessary to perform receiver tube optimization engineering analysis. The solar profile intensity gauge being produced by BDM for Sandia will provide the capability required by manufacturers and design engineers. Progress is reported. (WHK)

15549 **(SAND—80-1964/9) Midtemperature solar systems test facility predictions for thermal performance based on test data: solar kinetics T-600 solar collector with FEK 244 reflector surface.** Harrison, T.D. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. 23p. NTIS, PC A02/MF A01.

Sandia National Laboratories, Albuquerque (SNLA), is currently conducting a program to predict the performance and measure the characteristics of commercially available solar collectors that have the potential for use in industrial process heat and enhanced oil recovery applications. The thermal performance predictions for the Solar Kinetics T-600 solar line-focusing parabolic trough collector are presented for three output temperatures at five cities in the US. (WHK)

15550 **(SAND—81-2176C) CVD ZrB_2 as a selective solar absorber.** Randich, E.; Allred, D.D. (Sandia National Labs., Albuquerque, NM (USA); Energy Conversion Devices, Inc., Troy, MI (USA)). 1981. Contract AC04-76DP00789. 12p. (CONF-810425—2). NTIS, PC A02/MF A01.

From International conference on metallurgical coatings; San Francisco, CA, USA (6 Apr 1981).

Coatings of ZrB_2 and TiB_2 for photothermal solar absorber applications have been prepared using chemical vapor deposition (CVD) techniques. Oxidation tests suggest a maximum temperature limit for air exposure of 600 K for TiB_2 and 800 K for ZrB_2. Both materials exhibit innate spectral selectivity with emittance at 375 K

ranging from 0.06 to 0.09 and solar absorptance for ZrB_2 ranging from 0.67 to 0.77 and solar absorptance for TiB_2 ranging from 0.46 to 0.58. ZrB_2 has better solar selectivity and more desirable oxidation behavior than TiB_2. A 0.071 μm antireflection coating of Si_3N_4 deposited on the ZrB_2 coating leads to an increase in absorptance from 0.77 to 0.93, while the emittance remains unchanged.

15551 **(SERI-TP—632-958) Wind loading on tracking and field-mounted solar collectors.** Murphy, L.M. (Solar Energy Research Inst., Golden, CO (USA)). Dec 1980. Contract AC02-77CH00178. 10p. NTIS, PC A02/MF A01.

Current design and testing procedures for wind loading are discussed. The test results corresponding to numerous wind tests on heliostats, parabolic troughs, parabolic dishes, and field mounted photovoltaic arrays are discussed and the applicability of the findings across the various technologies is assessed. One of the most significant consistencies in the data from all of the technologies is the apparent benefit provided by fences and field shielding. Taken in toto, these data show that load reductions of three, or possibly more, seem feasible, though a more thorough understanding of the phenomena involved must be attained before this benefit can be realized. It is recommended that the required understanding be developed to take advantage of this benefit and that field tests be conducted to correlate with both analyses and tests.

15552 **(SERI/TR—632-812) Assessment of existing studies of wind loading on solar collectors.** Murphy, L.M. (Solar Energy Research Inst., Golden, CO (USA)). Feb 1981. Contract AC02-77CH00178. 35p. NTIS, PC A03/MF A01.

In developing solar collectors, wind loading is the major structural design consideration. Wind loading investigations have focused on establishing safe bounds for steady state loading and verifying rational but initial and conservative design approaches for the various solar collector concepts. As such, the effort has been very successful, and has contributed greatly to both the recognition and qualitative understanding of many of the physical phenomena involved. Loading coefficients corresponding to mean wind velocities have been derived in these prior studies to measure the expected structural loading on the various solar collectors. Current design and testing procedures for wind loading are discussed. The test results corresponding to numerous wind tests on heliostats, parabolic troughs, parabolic dishes, and field mounted photovoltaic arrays are discussed and the applicability of the findings across the various technologies is assessed. One of the most significant consistencies in the data from all the technologies is the apparent benefit provided by fences and field shielding. Taken in toto, these data show that load reductions of three or possibly more seem feasible, though a more thorough understanding of the phenomena involved must be attained before this benefit can be realized. It is recommended that the required understanding be developed to take advantage of this benefit and that field tests be conducted to correlate with both analyses and tests.

15553 **Black molybdenum photothermal converter layers deposited by pyrolytic hydrogen reduction of MoO_2Cl_2.** Gesheva, K.A.; Chain, E.E.; Seraphin, B.O. (Univ. of Arizona, Tucson). *Solar Energy Materials ;* **3**: No. 3, 415-424(Oct 1980).

Black molybdenum thin films, combining high infrared reflectance with significant solar absorptance, have been produced by pyrolytic hydrogen reduction of MoO_2Cl_2 in the temperature range 550 to 710°C on quartz as well as metal substrates. A respectable selectivity and significant temperature durability at 500°C in vacuum are obtained.

1420 Heat Storage

REFER ALSO TO CITATION(S) 15488, 15712

15554 (SAND—80-1666, pp 205-212) **Thermocline thermal energy storage.** Gross, R.J. (Sandia National Labs., Albuquerque, NM). Feb 1981.

From Line-focus solar thermal energy technology development conference; Albuquerque, NM, USA (9 Sep 1980).

Thermocline TES uses the system working fluid to store the thermal energy in a single, well-insulated tank. Use is made of natural buoyant forces and the extremely slow diffusive properties of liquids to keep the hot upper layer from the cold lower fluid layer. The attractive characteristic of thermocline storage is that theory shows it has the potential of being a very efficient storage concept. Thermocline storage is also economically attractive. A single-tank thermocline system consists of a tank filled with the system working fluid and two flow diffusers. With such a simple system, control, initial cost and maintenance cost could be minimal. The objective of the thermocline project at SNLA is to determine the feasibility of thermocline TES from a theoretical, operational, and economic standpoint. This will be done by testing an engineering prototype (1200 gallon) storage tank, small-scale laboratory test programs, and development of analytical computer models. Progress is reported. (WHK)

15555 **Improved solar heating systems.** Schreyer, J.M.; Dorsey, G.F. (to Dept. of Energy). US Patent Application 150,394. 16 May 1980. 10p.

An improved solar heating system is described in which the incident radiation of the sun is absorbed on collector panels, transferred to a storage unit and then distributed as heat for a building and the like. The improvement is obtained by utilizing a storage unit comprising separate compartments containing an array of materials having different melting points ranging from 75 to 180°F. The materials in the storage system are melted in accordance with the amount of heat absorbed from the sun and then transferred to the storage system. An efficient low volume storage system is provided by utilizing the latent heat of fusion of the materials as they change states in storing ad releasing heat for distribution.

15 GEOTHERMAL ENERGY

REFER ALSO TO CITATION(S) 15432

1501 Resource Status And Assessment

15556 **(DOE/ID/12018—8) Colorado geothermal commercialization program. Geothermal energy opportunities at four Colorado towns: Durango, Glenwood Springs, Idaho Springs, Ouray.** Coe, B.A.; Zimmerman, J. (Colorado Geological Survey, Denver (USA)). Jan 1981. Contract FC07-79ID12018. 66p. NTIS, PC A04/MF A01.

The potential of four prospective geothermal development sites in Colorado was analyzed and hypothetical plans prepared for their development. Several broad areas were investigated for each site. The first area of investigation was the site itself: its geographic, population, economic, energy demand characteristics and the attitudes of its residents relative to geothermal development potential. Secondly, the resource potential was described, to the extent it was known, along with information concerning any exploration or development that has been conducted. The third item investigated was the process required for development. There are financial, institutional, environmental, technological and economic criteria for development that must be known in order to realistically gauge the possible development. Using that information, the next concern, the geothermal energy potential, was then addressed. Planned, proposed and potential development are all described, along with a possible schedule for that development. An assessment of the development opportunities and constraints are included. Technical methodologies are described in the Appendix. (MHR)

1502 Geology And Hydrology Of Geothermal Systems

15557 **(DOE/ID/12030—12) Evaluation of hydrothermal resources of North Dakota. Phase I, Final technical report.** Harris, K.L.; Winczewski, L.M.; Umphrey, H.R.; Anderson, S.B. (North Dakota Univ., Grand Forks (USA). Engineering Experiment Station). 1 Apr 1980. Contract FC07ID12030. 181p. NTIS, PC A09/MF A01.

This evaluation is based on an analysis of existing data on file with the North Dakota Geological Survey (NDGS) and other state and federal agencies. The principle source of data used was the oil and gas well files maintained by the NDGS. A computer library was created containing all the necessary oil and gas well

data in the North Dakota Geological Survey oil and gas well files. Stratigraphic data, bottomhole-temperature data, and chemical data are presented in map form to show the geothermal gradient, temperature, and depth of potential hydrothermal aquifers and the chemical characteristics of potential hydrothermal aquifers.

15558 **Solidification in Kilauea Iki Lava Lake.** Hardee, H.C. (Sandia National Labs., Albuquerque, NM). *Journal of Volcanology and Geothermal Research ;* 7: No. 3/4, 211-223(May 1980).

The crust of Kilauea Iki lava lake currently consists of an upper porous two-phase (water/steam) convection zone 41 m thick and a lower conduction zone 12 m thick extending tof the melt. Although the solidification of the crust initially followed the classical square root of time law, the crust has been solidifying at a constant rate of 6.7×10^{-8} m/s for the past twelve years. The thickness of the lower zone of the crust also appears to have reached a constant value of 12 m. A moving solidification of front solution is developed which shows that the constant solidification rate and constant thickness of the lower crust zone are natural outcomes of a heat balance between the two zones of the crust. Observed temperature profile curvature from borehole temperature measurements in the lake can be explained in terms of the solidification front solution. The solution and temperature profile data can be used to estimate an average in-situ permeability of 0.30 darcy for the upper zone of the crust which agrees well with measured values.

15559 **Eruptions at Chaos Crags, Lassen Volcanic National Park, California.** Heiken, G.; Eichelberger, J.C. (Los Alamos Scientific Lab., NM). *Journal of Volcanology and Geothermal Research ;* 7: No. 3/4, 443-481(May 1980).

Chaos Crags are a group of silicic lava domes and associated tephra deposits composed of intermediate and silicic lavas on the edge of the central plateau of Lassen Volcanic National Park, California. The plateau coincides with a negative gravity anomaly interpreted as a large silicic magma reservoir. About 0.15 km^3 of rhyodacitic pyroclastic flows were erupted 1100 years ago from vents beneath the present Crags and flowed for 21 km down the valleys of Lost and Manzanita Creeks. Pumice pyroclasts in the flows are characterized by high phenocryst content and low vesicularity. These eruptions were followed by the extrusion of 1.25 km^3 of dacitic lava as a stubby flow and three-lobed dome. The tephra and lava appear to be products of intrusion of mostly liquid high-alumina basalt into a large, partially crystallized rhyolitic magma body with subsequent mixing. The earliest tephra contain only a minor basaltic component while the youngest portion of the Crags contain approximately 20%. This change with time reflects either a vertical zonation in the magma inherited from the mixing event or a continued admixing of basaltic magma within the chamber during the span of eruptive period.

1503 Geothermal Exploration And Exploration Technology

REFER ALSO TO CITATION(S) 15557

15560 **(AD-A—084080) Evaluation of geothermal potential of Range Bravo 20, Naval Air Station, Fallon. Final report May-Aug 79.** Whelan, J.A. (Naval Weapons Center, China Lake, CA (USA)). Apr 1980. 16p. NTIS, PC A02/MF A01.

Gravity, aeromagnetics, and temperature studies were made and it was concluded that deep drilling would be necessary to produce fluids of a temperature suitable for space heating. Therefore, additional studies of Range Bravo 20 should place emphasis on the west and southwest portions of the base. Incomplete studies indicate anomalous content of mercury in soils of the southwest portion of the range.

15561 **(LA—8686-MS) Comprehensive study of LASL Well C/T-2 Roosevelt Hot Springs KGRA, Utah, and applications to geothermal well logging.** Glenn, W.E.; Hulen, J.B.; Nielson, D.L. (Los Alamos Scientific Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 232p. NTIS, PC A11/MF A01.

Utah State Geothermal Well 9-1 in the Roosevelt Hot Springs KGRA, Beaver County, Utah, has been donated by Phillips Petroleum Company for calibration and testing of well-logging equipment in the hot, corrosive, geothermal environment. It is the second Calibration/Test Well (C/T-2) in the Geothermal Log Interpretation Program. A study of cuttings and well logs from Well C/T-2 was completed. This synthesis and data presentation contains most of the subsurface geologic information needed to effect the total evaluation of geophysical logs acquired in this geothermal calibration/test well, C/T-2.

15562 **(SAND—79-7117, pp 53-65) Computing downhole temperatures during geothermal drilling operations.** Wooley, G.R. (Enertech Engineering and Research Co., Houston, TX). Jan 1980.

In Workshop on geothermal drilling fluids.

A computer code, called GEOTEMP, has been constructed to compute downhole temperatures in a geothermal well during injection, production, circulation and drilling. Temperatures are computed in flowing fluids, annulus fluids, drill pipe and casings, cement, and in the formation at all depths and as a function of time. Model predictions show good agreement to exact solutions and to field temperature data. Sensitivity studies have established the importance of flow rate, inlet temperature, and depth on transient bottom-hole temperature and steady fluid temperature profile while circulating.

15563 **(SAND—81-0054C) GaP Schottky diodes for high temperature applications.** Weichold, M.H.; Eknoyan, O.; Coquat, J.A. (Texas A and M Univ., College Station (USA); Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 15p. (CONF-810510—2). NTIS, PC A02/MF A01.

From Electronic components conference; Atlanta, GA, USA (11 May 1981).

A need for high temperature electronic components has been established. In an effort to meet part of this need four metals have been evaluated for use in fabricating a Schottky barrier diode. Schottky diodes made from Pt, Cr, Al and Ni were aged for 1000 hours at 275°C. These devices were evaluated considering the barrier height, phi/sub bn/, and leakage current density, J/sub l/ as a function of aging time. Results indicate that the devices are dominated by a large surface state density which is partially compensated by prolonged aging. Nickel Schottky diodes emerge as the most stable devices.

15564 **Evaluaion of volcanic gas analyses from Kilauea Volcano.** Gerlach, T.M. (Sandia Labs., Albuquerque, NM). *Journal of Volcanology and Geothermal Research ;* 7: No. 3/4, 295-317(May 1980).

Much of the chemical variation and disequilibrium in Kilauean volcanic gas analyses is the result of contamination by meteoric water and, to a lesser extent, organic matter. Contamination by meteoric water is extensive in some samples, causing variations of two to three orders of magnitude in atomic H/C. Several of the widely quoted analyses for Jaggar's J-series collection are severely contaminated with meteoric water that did not equilibrate with the Magmatic gases and consequently gives the analyses a disequilibrium appearance. When the contaminating H_2O is removed, the analyses converge to equilibrium mixtures in the temperature range 1085°C to 1185°C with O_2 fugacities slightly above those for the quartz-magnetite-fayalite buffer. The restored analyses are richer in CO_2 (18 to 50%) and SO_2 (10 to 21%) and poorer in H_2O (37 to 70%) than are the original analyses. There is no single gas phase composition for erupting Kilauea basalts. The restored J-series gases and the higher quality gases collected from Kilauea since 1920 form a spectrum of gas compositions related by CO_2 content. A trend of decreasing CO_2 with progressive outgassing is suggested. The extremes in the spectrum of compositions, based on presently available data, range from an early magmatic gas containing 50% CO_2, 35% H_2O, and 15% SO_2 to a more evolved gas with 70% H_2O, 10% CO_2 and 20% SO_2.

15565 **Investigation of volcanic gas analyses and magma outgassing from Erta' Ale lava lake, Afar, Ethiopia.** Gerlach, T.M. (Sandia Labs., Albuquerque, NM). *Journal of Volcanology and Geothermal Research ;* 7: No. 3/4, 415-441(May 1980).

The analyses of 18 volcanic gas samples collected over a two-hour period at 1075°C from Erta' Ale lava lake in December 1971 and of 18 samples taken over a half-hour period at 1125 to 1135°C in 1974 display moderately to intensely variable compositions. These variations result from imposed modifications caused by (1) atmospheric contamination and oxidation, (2) condensation and re-evaporation of water during collection, (3) analytical errors, and (4) chemical reactions between the erupted gases and a steel lead-in tube. Detailed examinations of the analyses indicate the erupted gases were at chemical equilibrium before collection. This condition was partially destroyed by the imposed modifications. High-temperature reaction equilibria were more completely preserved in the 1974 samples. Numerical procedures based on thermodynamic calculations have been used to restore each analysis to a composition representative of the erupted gases. These procedures have also been used to restore the anhydrous mean compositions reported for two series of collections taken at the lava lake in January 1973.

1504 Legal And Institutional Aspects

15566 **(DOE/ET/27208—T1) Geothermal leasing and permitting data base: a tool for future planning. Final report, 22 August 1979-31 December 1980.** Beeland, G.V.; Schumann, E.; Wieland, M. (Wapora, Inc., Chevy Chase, MD (USA)). Dec 1980. Contract AC01-79ET27208. 124p. NTIS, PC A06/MF A01.

A data file on all separate actions taken by the responsible agencies in implementing the Geothermal Steam Act of 1970 was developed. A computerized data base on the non-competitive leasing program is described here. The required data were obtained from the files of the BLM State Offices where the lease applications are received and from Forest Service Regional Offices responsible for that agency's consultation. The states covered include: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Subsequently, the data file was expanded to include: the competitive leasing history by KGRA, pre-lease exploratory permits, post-lease exploratory permits, post-lease drilling permits, leases on state land, and state drilling permits. (MHR)

15567 **(DOE/ET/27208—T2) Potential effects of environmental regulatory procedures on geothermal development.** Beeland, G.V.; Boies, D.B. (Wapora, Inc., Chevy Chase, MD (USA)). Jan 1981. Contract AC01-80ET27208. 100p. NTIS, PC A05/MF A01.

The potential effects of several types of applicable environmental regulatory procedures on geothermal development were assessed, and particular problem areas were identified. The possible impact of procedures adopted pursuant to the following Federal statutes were analyzed: Clean Air Act; Clean Water Act; Safe Drinking Water Act; and Resource Conservation and Recovery Act. State regulations applicable, or potentially applicable, to geothermal facilities were also reviewed to determine: permit information requirements; pre-permit air or water quality monitoring requirements; effect of mandated time frames for permit approval; and potential for exemption of small facilities. The regulations of the following states were covered in the review: Alaska; Arizona; California; Colorado; Hawaii; Idaho; Montana; Nevada; New Mexico; Oregon; Utah; Washington; and Wyoming. (MHR)

1506 Environmental Aspects And Waste Disposal

REFER ALSO TO CITATION(S) 15567

15568 (PNL—3700(Pt.4), pp 103-109) **Heavy-metal and noxious-gas emission from geothermal resource development.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

Although geothermal energy is generally considered a relatively clean source of power, the high-temperature processes that create the hydrothermal provinces mobilize some undesirable constituents. In this section, we report on studies to characterize and compare effluents from a number of different geothermal sites and to determine pathways of constituents through geothermal power plants to the environs.

1508 Geothermal Power Plants

REFER ALSO TO CITATION(S) 15482

15569 **(EGG-PG-G—80-041) Analyses of mixed-hydrocarbon binary thermodynamic cycles for moderate-temperature geothermal resources.** Demuth, O.J. (EG and G Idaho, Inc., Idaho Falls (USA)). Feb 1981. Contract AC07-76ID01570. 22p. NTIS, PC A02/MF A01.

A number of binary geothermal cycles utilizing mixed hydrocarbon working fluids were analyzed with the overall objective of finding a working fluid which can produce low-cost electrical energy using a moderately-low temperature geothermal resource. Both boiling and supercritical shell-and-tube cycles were considered. The performance of a dual-boiling isobutane cycle supplied by a 280°F hydrothermal resource (corresponding to the 5 MW pilot plant at the Raft River site in Idaho) was selected as a reference. To investigate the effect of resource temperature on the choice of working fluid, several analyses were conducted for a 360°F hydrothermal resource, which is representative of the Heber resource in California. The hydrocarbon working fluids analyzed included methane, ethane, propane, isobutane, isopentane, hexane, heptane, and mixtures of those pure hydrocarbons. For comparison, two fluorocarbon refrigerants were also analyzed. These fluorocarbons, R-115 and R-22, were suggested as resulting in high values of net plant geofluid effectiveness (watt-hr/lbm geofluid) at the two resource temperatures chosen for the study. Preliminary estimates of relative heat exchanger size (product of overall heat transfer coefficient times heater surface area) were made for a number of the better performing cycles.

15570 **(SAND—80-1522) Preliminary analysis of two aspects of magma-powered electric-generation plants.** Hoover, E.R. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1980. Contract AC04-76DP00789. 26p. NTIS, PC A03/MF A01.

Two aspects critical to the development of magma electric generation plants using closed heat exchanger systems are addressed. The heat transfer between the cold fluid in the downcomer and the hot fluid in the upcomer is analyzed using an NTU-effectiveness technique. The results indicate the hot fluid must be thermally insulated from the colder fluid in order to yield a useful temperature difference at the surface. A preliminary system analysis is conducted to determine the well cost requirements of an economically competitive magma electric plant. There is no economic incentive to make the magma tap wellbore larger than conventional deep gas wells. The cost competitiveness of a magma/electric plant is influenced by the depth to the magma, the convective heat flux of the magma, and the expected life of each well.

1509 Geothermal Engineering

REFER ALSO TO CITATION(S) 15570, 15582

15571 **(DOE/ET/27081—2) Testing geopressured geothermal reservoirs in existing wells. Annual report.** (Eaton Industries of Houston, Inc., TX (USA)). 1980. Contract AC08-80ET27081. 75p. NTIS, PC A04/MF A01.

This contract called for the acquisition and testing of Wells of Opportunity. Wells of Opportunity are located by screening published information on oil industry activity and through personal contacts with oil operators. This process resulted in recommendation of 21 candidate wells to the DOE for the WOO program. Of the 21 wells recommended, 7 were accepted. Six of these 7 were

acquired for testing. Three wells have been tested, and the fourth and fifth will be tested early in 1981. Preliminary test results are briefly described and are shown in a table. The actual testing schedule and the originally proposed schedule matched very closely. Cumulative costs through November 1980 were approximately $6.5 million and compare to an estimate of $8.5 million for the same period. A graphical comparison of actual versus estimated costs is given.

15572 **(DOE/ET/28317—T1) Localized corrosion in materials for geothermal power.** Roy, A.; Peterson, J.A.; Hehemann, R.F.; Troiano, A.R. (Case Western Reserve Univ., Cleveland, OH (USA). Dept. of Metallurgy; Armco, Inc., Middletown, OH (USA)). Dec 1980. Contract AS02-76ET28317. 90p. NTIS, PC A05/MF A01.

Ten different commercially available steels were examined for general and localized corrosion in 14 different environmental conditions. The chloride concentration was varied from 1 to 24 percent. In general, the influence of chloride was minor and seemed slightly more agressive at 1 than at 5 or 24 percent. The brines were examined with and without saturated H_2S. Saturation with H_2S increased the general corrosion rate but appeared to reduce crevice attack in the acid solutions. Selected brines were examined in both acid and neutral conditions. As anticipated, a neutral brine with or without H_2S greatly reduced all forms of attack. Tests at 150°C exhibited greater attack than at ambient. A relatively new alloy, Ni-Cu-Cb, consistently demonstrated good resistance to both general and localized attack. Typical economical N80 grade steels clearly demonstrated the strong dependence of localized attack on inclusion variables and offer great promise in the minimized and/or controlled inclusion condition. The Cr-Mo steels surprisingly did not look good at ambient but did exhibit substantial improvement at 150°C. The laboratory tests gave higher weight loss values for similar steels recently tested in a well; although in neutral brines without saturated H_2S, the difference was not significantly larger.

15573 **(ORNL/TM—7681) Silica scaling in simulated geothermal brines.** Bohlmann, E.G.; Shor, A.J.; Berlinski, P.; Mesmer, R.E. (Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 126p. NTIS, PC A07/MF A01.

A 6.3 1/sec (100 GPM) titanium corrosion test loop was modified to provide a dynamic facility for studying the formation of silica deposits, their properties and fates, as a function of brine composition, temperature, and flow conditions. Scale formation was studied in a segmented heat exchanger operating under realistic conditions; the segmented design permitted examination of scale formations in five temperature regimes. The program was terminated after minimal exploratory operation because of reduced sponsor perceptions of the need for concern with scaling problems. The runs which were completed dealt cursorily with brine concentration and pH effects. Results are presented.

15574 **(SAND—79-7117) Workshop on geothermal drilling fluids.** (Sandia National Labs., Albuquerque, NM (USA)). Jan 1980. Contract AC04-76DP00789. 69p. NTIS, PC A04/MF A01.

Thirteen papers and abstracts are included. Seven papers were abstracted and six abstracts were listed by title. (MHR)

15575 (SAND—79-7117, pp 9-12) **Sandia/DOE geothermal drilling and completion technology development program.** Barnette, J.H. (Sandia Labs., Albuquerque, NM). Jan 1980.

In Workshop on geothermal drilling fluids.

The Division of Geothermal Energy (DGE) of the US Department of Energy (DOE) has initiated a program aimed at developing new drilling and completion techniques for geothermal wells. The goals of this program are to reduce well costs 25% by 1982 and 50% by 1986. This paper presents an overview of the program. A statement of program goals and structure is given. The content of the FY-79 program is presented and recent results of R and D projects are given. Plans for development of an advanced drilling and completion system are discussed.

15576 (SAND—79-7117, pp 13-21) **Evaluation of geothermal foams.** Matula, G.W. (Maurer Engineering Inc., Houston, TX). Jan 1980.

In Workshop on geothermal drilling fluids.

A total of 36 samples were submitted by 15 suppliers for testing. Eight of the submitted materials were selected for actual testing. Selection was based on availability of a sufficient amount of sample to complete all tests and timely reception of the samples. The foamers were tested before and after exposing water solutions of the materials to 500°F at an applied nitrogen pressure of 375 psi for 16 hours. These tests indicated that completely new materials will have to be developed in order to satisfy geothermal applications. (MHR)

15577 (SAND—79-7117, pp 41-43) **High temperature clay chemistry.** Guven, N.; Carney, L.L. (Texas Tech Univ., Lubbock). Jan 1980.

In Workshop on geothermal drilling fluids.

Rheological and mineralogical changes in clays such as sepiolite, attapulgite, saponite, and bentonite subjected to hydrothermal treatments with and without the addition of the salts and hydroxides of Na, K, Ca, and Mg are reported. (MHR)

15578 (SAND—79-7117, pp 47-51) **Field trial of HTM-1.** Remont, L.J. (Maurer Engineering Inc., Houston, TX). Jan 1980.

In Workshop on geothermal drilling fluids.

A mud which has desirable properties when prepared at room temperature and retains these properties even after being heated to 500°F was developed. The mud formulation is given and planned field tests are described. (MHR)

15579 (SAND—79-7117, pp 67-70) **Effect of stagnation time upon wellbore permeability.** Enniss, D. Jan 1980.

In Workshop on geothermal drilling fluids.

The residence time of the internal filter cake (cake formed actually within the formation) after deposition and before backflow is termed the stagnation time and is investigated here. Permeability impairment was determined as a function of varying stagnation times, mud types and temperatures.

1510 Direct Energy Utilization

15580 **(CONF-810315—7) Hydrothermal energy development projects.** DiBello, E.G. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 4p. NTIS, PC A02/MF A01.

From 8. energy technology conference and exposition; Washington, DC, USA (9 Mar 1981).

The development of hydrothermal energy for direct heat applications is being accelerated by twenty-two demonstration projects that are funded on a cost-sharing basis by the US Department of Energy, Division of Geothermal Energy. These projects are designed to demonstrate the technical and economic feasibility of the direct use of hydrothermal resources in the United States. Engineering and economic data for the projects are summarized. The data and experience being generated by these projects will serve as an important basis for future direct heat development.

15581 **Geothermal district heating projects and potential.** pp 23p, Section 6 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

A program to identify, assess, and confirm the extent of the resource potential of geothermal energy while seeking private and public ideas for utilizing the resource is described. Agreements have been made with 21 of the 37 states that have geothermal potential. The Application Projects emphasize cost-shared demonstrations for which 22 have been funded the past 2 years. Nine of the projects are for district heating and 7 are for institutional and individual users. Information on some sample applications is shown. (MCW)

1520 Geothermal Data And Theory

REFER ALSO TO CITATION(S) 15561

15582 Experimentally determined rock-fluid interactions applicable to a natural hot dry rock geothermal system. Charles, R.W.; Holley, C.E. Jr.; Tester, J.W.; Blatz, L.A.; Grigsby, C.O. (Los Alamos Sci Lab, NM). *TMS (The Metallurgical Society) Paper Selection ;* A80.1-A80.47 (1980).

Samples of the granodiorite from the actual reservoir and Tijeras Canyon granite have been reacted with distilled water and various solutions of NaCl, NaOH, and Na/sub 2/CO/sub 3/. The results are compared to observations made in field experiments done in a hot dry rock reservoir at a depth of approximately 3 km with initial rock temperatures of 150 to 200/degree/C. The concept known as hot dry rock geothermal energy involves the creation of heat transfer surface area by hydraulically fracturing the rock between two wells. 14 refs.

17 WIND ENERGY

REFER ALSO TO CITATION(S) 15749

1701 Availability (climatology)

15583 (AD-A—084604) Richards-Gebaur AFB, Kansas City, Missouri. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report. (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 31 Mar 1980. 452p. NTIS, MF A01.

This report is a six-part statistical summary of surface weather observations for Richards-Gebaur AFB, Kansas City, Missouri. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15584 (AD-A—084605) F.E. Warren AFB, Cheyenne, Wyoming. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report. (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 1 May 1980. 476p. NTIS, MF A01.

This report is a six-part statistical summary of surface weather observations for F E Warren AFB, Cheyenne, Wyoming. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15585 (AD-A—084606) Furth Germany AAF. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report. (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 7 Jul 1966. 304p. NTIS, PC A14/MF A01.

This report is a six-part statistical summary of surface weather observations for Furth AAF, Furth, Germany. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15586 (AD-A—084607) Gablingen Germany AAF. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report. (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 3 Feb 1972. 342p. NTIS, MF A01.

No abstract available.

15587 (AD-A—084608) Finthen AAF, Mainz, Germany. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report. (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 8 Mar 1972. 416p. NTIS, MF A01.

This report is a six-part statistical summary of surface weather observations for Finthen AAF, Mainz, Germany. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15588 (AD-A—084609) Kitzingen AAF, Kitzingen, Germany. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report. (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 5 Mar 1974. 434p. NTIS, MF A01.

This report is a six-part statistical summary of surface weather observations for Kitzingen AAF, Kitzingen, Germany. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15589 (AD-A—084610) Giebelstadt Aux AF, Wurzburg, Germany. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report. (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 16 Oct 1975. 405p. NTIS, PC A18/MF A01.

This report is a six-part statistical summary of surface weather observations for Giebelstadt Aux AF, Wurzburg, Germany. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb tempera-

ture depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15590 **(AD-A—084611) Charleston AFB, Charleston, South Carolina. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report.** (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 23 Apr 1980. 462p. NTIS, MF A01.

This report is a six-part statistical summary of surface weather observations for Charleston AFB, Charleston, South Carolina. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15591 **(AD-A—084612) Hohenfels AAF, Amberg Germany. Revised uniform summary of surface weather observation (RUSSWO). Parts A-F. Final report.** (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 10 Feb 1972. 385p. NTIS, MF A01.

This report is a six-part statistical summary of surface weather observations for Hohenfels AAF, Amberg, Germany. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15592 **(AD-A—084613) Hanau AAF, Hanau, Germany. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report.** (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 4 Oct 1974. 428p. NTIS, MF A01.

This report is a six-part statistical summary of surface weather observations for Hanau AAF, Hanau, Germany. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15593 **(AD-A—084614) Grafenwohr AAF, Graffenwohr, Germany. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report.** (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 15 Feb 1972. 443p. NTIS, PC A19/MF A01.

This report is a six-part statistical summary of surface weather observations for Grafenwohr AAF, Grafenwohr, Germany. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

15594 **(AD-A—084615) Heidelberg AAF, Heidelberg, Germany. Revised uniform summary of surface weather observations (RUSSWO). Parts A-F. Final report.** (Air Force Environmental Technical Applications Center, Scott AFB, IL (USA)). 11 Mar 1974. 434p. NTIS, MF A01.

This report is a six-part statistical summary of surface weather observations for Heidelberg AAF, Heidelberg, Germany. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling Versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew-point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables.

1704 Economics

15595 **(SERI/TR—732-604(Vol.1)) Electric utility value determination for wind energy. Volume I. A methodology.** Percival, D.; Harper, J. (Solar Energy Research Inst., Golden, CO (USA)). Feb 1981. 89p. NTIS, PC A05/MF A01.

This report describes a method electric utilities can use to determine the value of wind energy systems. It is performed by a package of computer models available from SERI that can be used with most utility planning models. The final output of these models gives a financial value ($/kW) of the wind energy system under consideration in the specific utility system. This report, first of two volumes, describes the value determination method and gives detailed discussion on each computer program available from SERI. The second volume is a user's guide for these computer programs.

15596 **(SERI/TR—732-604(Vol.2)) Electric utility value determination for wind energy. Volume II. A user's guide.** Percival, D.; Harper, J. (Solar Energy Research Inst., Golden, CO (USA)). Feb 1981. 115p. NTIS, PC A06/MF A01.

This report describes a method for determining the value of wind energy systems to electric utilities. It is performed by a package of computer models available from SERI that can be used with most utility planning models. The final output of these models gives a financial value ($/kW) of the wind energy system under consideration in the specific utility system. This volume, the second of two volumes, is a user's guide for the computer programs available from SERI. The first volume describes the value determination methodology and gives detailed discussion on each step of the computer modeling.

1706 Wind Energy Engineering

REFER ALSO TO CITATION(S) 15475

15597 (SAND—80-2820C) Dynamic analysis of Darrieus vertical axis wind turbine rotors. Lobitz, D.W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810226—2). NTIS, PC A02/MF A01.

From 2. DOE/NASA wind turbine dynamics workshop; Cleveland, OH, USA (24 Feb 1981).

The dynamic response characteristics of the VAWT rotor are important factors governing the safety and fatigue life of VAWT systems. The principal problems are the determination of critical rotor speeds (resonances) and the assessment of forced vibration response amplitudes. The solution to these problems is complicated by centrifugal and coriolis effects which can have substantial influence on rotor resonant frequencies and mode shapes. This paper will describe and discuss the primary tools now in use at Sandia National Laboratories for rotor analysis. These tools include a lumped springmass model (VAWTDYN) and also finite-element based approaches. The discussion will center on the accuracy and completeness of current capabilities and plans for future research.

20 ELECTRIC POWER ENGINEERING

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 15431, 15482, 15743, 15795

15598 (AD-A—084399) Comprehensive study of the Tocks Island Lake Project and alternatives. Contract report. (URS/Madigan-Praeger, Inc., New York (USA)). Jul 1975. Contract DACW51-75-C-0026. 48p. NTIS, PC A03/MF A01.

The purpose of this study is to help decision makers determine future water resource needs of the Delaware River Basin area and ways of meeting these needs. This report, undertaken in 1975, is a summary of the demands placed upon the water resources of the Basin and investigation of the alternatives proposed to meet or modify these demands. The water supply needs, outdoor recreation demands, salinity intrusion conditions, flood control needs and both present and future electric power generating capacity are briefly described. An evaluation of the proposed Tocks Island Project and alternative programs includes a summary of direct costs and benefits, land use goals, primary and secondary local economic impacts, public infrastructure impacts, local social impacts etc. This summary review describes only significant points of the findings of the consultant. For a more complete analysis, the 5 appendixes of this report should be studied.

15599 (AD-A—084531) Electrical equipment for electric power stations and substations (selected chapters). Baptidanov, L.N.; Tarasov, V.I. (Foreign Technology Div., Wright-Patterson AFB, OH (USA)). 7 Nov 1979. Translation of Elektrooborudavaniye Elektricheskikh Stantsiy i Postantsiy, Volume 2, 9-152, 185-320(1959). 1030p. NTIS, PC A99/MF A01.

15600 (ANL/CNSV-TM—14) Proceedings of the international conference on European waste-to-energy technology. (Argonne National Lab., IL (USA)). Sep 1980. 278p. (CONF-8010144—). NTIS, PC A13/MF A01.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

A separate abstract was prepared for each of the 13 papers presented at the conference.

15601 (ANL/CNSV-TM—14, pp 3-31) European and American experiences: a point of view. Bailly, H.C. (Hagler, Bailly and Co., Washington, DC). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

There were 23 waste-to-energy-systems operating in the US in 1979, and more than 180 plants currently recovering energy from municipal solid waste in Western Europe. In order to discuss and compare experiences in the US and Europe, two questions are answered - what forces were present in Europe during the post World War II era that can explain the rapid development of waste-to-energy systems and what conclusion can be drawn for the development of waste-to-energy systems in the US. A parallel is drawn between the market forces active in the US and Europe in the postwar era and the forces that have emerged since the mid-1970s. (MCW)

15602 (ANL/CNSV-TM—14, pp 33-52) European waste-to-energy know-how. Engdahl, R.B.; Beltz, P.R. (Battelle Columbus Labs., OH). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

An evaluation of European refuse-fired energy systems design practices observed in visits in 1977 to 15 European refuse-fired steam- and hot-water generators is presented. A major inpetus for the development of European waste-to-energy systems was the finding that it is possible to control air pollution from the burning of wastes if the dirty exhaust gases are partially cooled in a boiler. Concurrent with this influence was the disenchantment with old leaching landfills as a long-range solution to the solid waste problem in very crowded countries. The major conclusion is that the mass-burning of unprepared municipal solid waste in heat recovery boilers is well established, and can be a technically reliable, environmentally acceptable, and economic solution to the problem of disposal of solid wastes. Many European areas are moving steadily in the direction of Energy and Environmental Parks that often include refuse burning, electricity production, sewage disposal, industrial waste processing and steam generation and hot-water district heating. Many conditions in the US have favored landfilling, hence waste-to-energy has not advanced as rapidly as in Europe, but we are moving rapidly toward minimal landfill site availability in most of our metropolitan areas. Hence the lessons that have been learned in 80 years of refuse-fired plant (RFEP) experience in Europe can be effectively utilized by many US communities.

15603 (ANL/CNSV-TM—14, pp 57-82) Martin system. Martin, W.J.; Weiand, H. (Josef Martin Feuerungsbau GmbH, Munich, Germany). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

The construction of incineration plants, particularly refuse incineration plants, and the manufacture of Martin Reverse Acting Stoker Grates and Martin Ash Dischargers is discussed. Up to 1980, there had been more than 500 Martin Reverse Acting Stoker Grates and about 6000 Martin Ash Dischargers constructed. Martin plants of different design and with different applications of the energy recovered are examined to illustrate the technology at Bazenheid, Switzerland; Vienna-Spittelau, Austria; Hamburg-Stellinger Moor, German Federal Republic; Zurich-Josefstrasse, Switzerland; and Munich-North, German Federal Republic. Features of the design are described. Environmental performance is examined.

15604 (ANL/CNSV-TM—14, pp 83-102) Energy generation and refuse disposal at Issy-Les-Moulineaux plant, Paris. Fifteen years of operating experience. Defeche, J. Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

The operating experience obtained at the Issy-les-Moulineaux plant in Paris is summarized. The plant consists of 4 refuse incinerator units and two turbines. The installation contains a ramp for refuse vehicles, a refuse bunker, two boiler houses, four electrostatic precipitators, two stacks, an ash pit, and fly ash storage bin. Each stoker-boiler unit is designed for a normal refuse throughput of 15 Mg/h and a maximum refuse throughput of 17 Mg/h at a net calorific value of 3770 to 10,500 kJ/kg and a maximum refuse heat release of 157 GJ/h. The steam production of each boiler is about 40 Mg/h and the steam condition at the superheater outlet is 53 bars. Operating statistics, operating philosophy, maintenance work, technical improvements, and operating costs are described.

15605 (ANL/CNSV-TM—14, pp 103-124) **Wheelabrator-Frye/Von Roll approach to refuse-to-energy systems.** Dirilgen, N. (Von Roll Ltd., Zurich, Switzerland); Luthy, R.M. Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

The Environmental Engineering Division of the Wheelabrator-Frye/Von Roll corporation acts as an engineering contractor with technological know-how in municipal refuse incineration; industrial or hazardous waste incineration; waste water treatment; sludge treatment; and co-disposal plants for the disposal of sludge and municipal or industrial refuse optimizing the energy recovery. A history of the European systems is given. The grate design, combustion chamber, integrated boiler, and flue gas cleaning are described. Some advantages of each of the processes are summarized.

15606 (ANL/CNSV-TM—14, pp 125-133) **Presentation by Wheelabrator-Frye, USA.** Batton, L.K. (Wheelabrator-Frye, Inc., Saugus, MA). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

The operating experience at RESCO is summarized. The facility consists of two 750-ton-per-day refuse-fired steam generators and a storage pit and is capable of processing 1600 tons per day. It produces high temperature/pressure turbine quality steam which is sold. Current data are: 1.5 million tons processed; 8.7 billion pounds of steam sold; 100,000 tons of ferrous metal recovered; and 69 million gallons of oil displaced. Personnel, maintenance programs, financial return, and reliability are briefly described.

15607 (ANL/CNSV-TM—14, pp 155-189) **Evolution of mass-fired water wall waste to energy technology as practiced by Widmer + Ernst Ag.** Ernst, T.P. (Widmer and Ernst, Ag, Wettingen, Switzerland). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

Widmer and Ernst Ag markets the European developed technology in the Western Hemisphere. Fourteen plants are in successful operation in Western Europe with a number of others in the design and/or construction stage. Widmer and Ernst Inc. has been selected by the State of Rhode Island for a waste-to-energy plant with a daily capacity of 1200 tons of waste. Widmer and Ernst's system is a mass-fired, water wall using a unique grate design now in its third generation of evolution. All plants are capable of, and are currently meeting, the most stringent environmental pollution codes in Europe. At Ingolstadt, in Bavaria, W and E has in operation a codisposal plant reducing both municipal solid waste and sewage sludge to ash.

15608 (ANL/CNSV-TM—14, pp 191-203) **Domestic refuse incineration with the Katy-Seghers system: presentation of the process.** De Geyter, F. (Univ. of Louvain, Belgium); Soenens, J.; Beckman, A.H. Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

Incineration is the ideal alternative to landfilling as the final disposition of municipal solid waste. Incineration has the advantages of 90% volume reduction to a completely odorless inert product, potential for recovery of valuable heat energy and existing technology to remove dust and pollutants from the flue gas to meet the most severe environmental requirements. Seghers Engineering of Brussels, Belgium owns a proven incinerator oven system which is marketed world wide. The North American licensee is the Katy-Seghers Incinco Systems Div. of Fulton Iron Works. This presentation describes the Katy-Seghers process and includes background information on Seghers Engineering, technological description of the system, operation, economies and marketing philosophy.

15609 (ANL/CNSV-TM—14, pp 207-227) **VKW mass burning technology: its history and its applications.** Otte, H.P. (Browning-Ferris Industries, Houston, TX); Westphal, B.W.; Hick, H. Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

Development of mass burning technology at Vereinigte Kesselwerke Ag in West Germany is followed. Its business encompasses the area of designing, manufacturing, and building water and wastewater treatment facilities, sludge handling facilities, residential, commercial, and industrial solid waste incineration facilities, and air and gas cleaning facilities. Technological and design features of the system and performance of the systems at specific locations are described. It is concluded that any waste disposal project is a cooperative effort between government and the supplier and some risks must be shared by each.

15610 (ANL/CNSV-TM—14, pp 230-232) **Waste Management's role in system delivery.** Gershowitz, H. (Waste Management, Inc., Oak Brook, IL). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

Waste Management, Inc. is the prime contractor in North America for the Danish-designed mass combustion technology, waste-to-energy process of System Volund. Waste Management also has the capability to provide complete system integration, including waste disposal support activities such as waste transfer and land disposal. Resource recovery experiences of Waste Management and how it came to be committed to System Volund are followed.

15611 (ANL/CNSV-TM—14, pp 233-242) **System Volund technology.** Kjaer, G. (Volund U.S.A. Ltd., Oak Brook, IL). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

A summary of the activities at the System Volund of Copenhagen, Denmark is presented with specifics on its energy-related activities. Its activities in companies in Sweden, West Germany, France, United Kingdom, Singapore, and the USA are briefly cited. Volund's design and installation of equipment for energy recovery from solid wastes are evaluated. Solid waste incinerators with energy recovery, plant design and technology, furnace/boiler design, boiler conditions, rotary kiln and residue treatment, pollution control, plant operation control, building design, and plant reliability are briefly described.

15612 (ANL/CNSV-TM—14, pp 249-257) **System economics.** Gershowitz, H. (Waste Management Inc., Oak Brook, IL). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

The intention of Waste Management, Inc. to pursue mass combustion waste-to-energy opportunities as a full-service contractor using a Volund plant is noted. Energy recovered from solid waste in a Volund plant can be delivered in hot water, low or high temperature steam, or electricity forms. Typical plant economics are discussed. The effect of inflation on plant economics, economies of scale in plant size, and project financing are discussed.

15613 **(EPRI-AP—1643) Development of a reliability prediction methodology for a gasification-combined-cycle power plant.** Blair, J.; Witt, J.; Neely, M. (Arinc Research Corp., Annapolis, MD (USA)). Nov 1980. 188p. NTIS, PC A09/MF A01.

This report documents the development of a reliability-prediction methodology to be used in analyzing designs of gasification combined-cycle (GCC) power plants. The project was based on the hypothesis that to ensure economic GCC plant performance, it is necessary to treat plant reliability and availability as design parameters. This methodology was developed from the design of an 1100-megawatt baseload power plant prepared by Fluor Engineers and Constructors, Inc. and described in EPRI Report AF-642 of January 1978. The design incorporates seven gas turbines, one steam turbine, and five oxygen-blown gasifiers of the Texaco type. The methodology developed in the project was used for two purposes: to prepare a preliminary, quantitative assessment of the inherent operating reliability of the reference plant design, and to identify and rank the high-risk components that were incorporated in the plant. The application begins with the definition of all possible system states, or levels of output, at which the GCC plant can operate. The plant's operation is then modeled as a Markov chain process, which allows an assessment of its expected output over all possible states as a function of time. Sensitivity analyses are performed to

rank the plant's major components in terms of their impact on a defined measure of system reliability. The results of the plant assessment and the sensitivity analyses are presented, as well as the component-level failure-rate data base used to derive them.

15614 **(EPRI-AP—1681-SU) High-reliability gas turbine Combined-Cycle Development Program: Phase I. Summary.** Kunkel, R.G. (General Electric Co., Schenectady, NY (USA). Gas Turbine Div.). Jan 1981. 70p. NTIS, PC A04/MF A01.

The objective of this program is to generate a new conceptual centerline design for gas turbine and accessories, with reliability as the key parameter. Tradeoff studies of reliability versus cost, performance, firing temperature and other parameters formed the basis for all major design approaches and decisions. This program results in the conceptual design of a gas turbine combined-cycle plant with high reliability and performance to warrant consideration for baseload service, fuels flexibility for distillate and residual fuels, turbine emissions which meet the more stringent New Source Performance Standards, identified conversion requirements for coal-derived fuels and peaking/mid-range duty cycles, and identified list of potential present product retrofits. This conceptual combined-cycle design is planned, to be a commercial offering by the mid 80's. The inherent reliability, as defined by field data, was used as a basis from which to predict the expected reliability and power cost of a variety of near term conceptual gas turbine hardware and cycle configurations. The results indicated that the highest reliability, the lowest power cost, and greatest fuels flexibility may not be found within one configuration. The configuration selection criteria was based upon the highest reliability and fuel flexibility. This directed the choice to a near-term combined-cycle gas turbine plant firing at 1985°F (1085°C) and a pressure ratio of 12:1. Consequently, the new gas turbine for this program was conceptually developed around the 1985°F (1085°C) firing temperature cycle. The total plant was developed using maintainability, serviceability and the potential need for conversion to coal-derived fuels and other duty cycles. The controls and accessories were found to provide cost effective changes and modifications.

15615 **(EPRI-AP—1681(Vol.2)) High-reliability gas turbine combined-cycle development program. Phase I. Final report.** Kunkel, R.G. (General Electric Co., Schenectady, NY (USA). Gas Turbine Div.). Jan 1981. 350p. NTIS, PC A15/MF A01.

The results of the General Electric study indicated that the availability goals could be met at all levels of equipment, from the combustion-turbine unit to the total plant, but that mean-time-between-failures (MTBF) goals could only partially be met. The combustion-turbine unit alone could approximately meet the MTBF goal (9000 hours), while the combustion-turbine system could only reach an MTBF of about 1000 hours. When the steam cycle and its electric generator, associated equipment, and balance-of-plant items were added, the total plant MTBF was predicted to be no greater than roughly 500 hours. The field-data analyses indicated that the number of forced outages in the combustion-turbine system were caused mainly by the ancillary equipment, while the major contributor to the number of forced outage hours was the combustion turbine. Although some of the combustion turbines perform well, they offer the greatest potential for improvement. Accessories such as the control system and the fuel system also offer a great potential for improving the reliability performance. It was hoped that field-data analysis and reliability trade-off analysis would result in a clear picture of the desired changes and their contribution to improved reliability; however, the field data were not specific enough, and the analytic effort contained sufficient compromises, so that a definitive list of reliability-improving changes was not feasible. It was feasible, however, to determine some beneficial design parameters and to arrive at a design with a significant improvement in reliability. These modifications include the application of redundancy, improvement in accessories (such as controls and instrumentation) and the addition of diagnostic capabilities.

15616 **(EPRI-AP—1712) Test and evaluation of methanol in a gas turbine system. Final report.** Weir, A. Jr.; vonKleinSmid, W.H.; Danko, E.A. (Southern California Edison Co., Rosemead (USA)). Feb 1981. 239p. NTIS, PC A11/MF A01.

A test was conducted to compare the operational and emission characteristics of two Turbo Power and Marine Systems, Inc. (TPM) gas turbines, one operating on distillate fuel (Jet A) and the other operating on methanol. The test, which included 523 h of methanol burn time, was conducted at Southern California Edison Company's (SCE) Ellwood Energy Support Facility in Goleta, California. The facility consisted of two gas turbines combined with an electric generator in a TP-4 Twin Pac configuration. Normally, distilled water is injected into the combustion chambers of each turbine to reduce oxides of nitrogen emissions. During the major portion of the program, no water was injected into the methanol fueled turbine. Periodically during the program, performance and emission tests as well as physical inspections of the hot section of each turbine were conducted. Emission and performance tests were also conducted on natural gas. One series of tests was conducted with distilled water injected into the combustion chamber during methanol operations. Oxides of nitrogen emissions on the methanol-fueled turbine, without water injection, were approximately 80% of the emissions of the distillate fueled turbine with water injection. There was a significant reduction in particulate emissions during methanol operation. An additional reduction in oxides of nitrogen emission was obtained during operations of the methanol-fueled turbine with water injection. No significant problems occurred during the test that could be attributed to firing methanol. The hot end inspections indicated cleaner components within the methanol fueled turbine.

15617 **(EPRI-CS—1665) Investigation of numerical modeling techniques for recirculating flows: Parts 1 and 2. Final report, February 1981.** (Envirodyne Ltd., Waterloo, Ontario (Canada)). Feb 1981. 241p. NTIS, PC A11/MF A01.

The results of an effort to develop a three-dimensional numerical model for recirculating flows for the purpose of predicting plume recirculation in mechanical draft cooling towers are presented. Part 1 provides a literature review and presents prevailing views of turbulence modeling for various physical problems. A novel model is then presented which adapts the full Reynolds stress equations. Part 2 deals with the cost of the solution of a large set of equations that comprise the mathematical model. Several promising cost-reducing methods are described.

15618 **(EPRI-CS—1693) Failure cause analysis: fans. Final report.** Wood, C.O. (Fan Systems Co., Sun City West, AZ (USA)). Feb 1981. 135p. NTIS, PC A07/MF A01.

Surveys by the Edison Electric Institute have identified power plant fans to be a significant cause of plant failures. This report contains the results of a study to identify fan problem areas, their causes and their effects. A data base of 743 fans was prepared from questionnaires distributed to US utilities and to the Tennessee Valley Authority. Additional information was obtained from personal contacts with various power company personnel, station records and reports, and EPRI files. The great majority of fans studied were centrifugal units used in forced draft, induced draft, primary air, and gas recirculating applications. As controllable-pitch axial fans have seen service only recently in the United States, the number of such fans available for study is relatively small. Data analysis resulting clearly demonstrates problems with draft fan systems and their components which contribute to the unavailability of generating units. Seventeen specific problem components are identified for centrifugal fans; bearings, blades, and foundations account for more than 54% of the centrifugal fan problems. Nine specific problem components are identified in the case of axial fans; blade, shaft bearings, and blade thrust bearings account for over 52% of the axial fan problems. The indicated causes and effects are documented. Recommendations are made to improve the reliability of existing fans, and generic problems requiring future research and application of existing technologies are identified. It is also recommended that users place less emphasis on the initial costs of fans and more emphasis on those design features that improve reliability to encourage manufacturers to accelerate their efforts to improve the technology and correct critical problems. Implementation of the recommendations could substantially improve the availability of fans.

15619 (EPRI-CS—1718) Assessment of control system technology used in fossil-fired generating plants. Final report. Kalnitsky, K.C.; Price, C.F.; Vinje, E.W. (Analytic Sciences Corp., Reading, MA (USA)). Feb 1981. 139p. NTIS, PC A07/MF A01.

This report is an assessment of the state-of-the-art of control system technology used in fossil-fired generating plant design and analysis. The assessment includes a review of the plant design process, with particular attention paid to current control system design practices. These practices are examined in the light of dynamic operating conditions, such as occur in cycling, and are compared to the capabilities offered by modern multivariable systems design and analysis procedures. Multivariable techniques can provide operational improvements for generating plants which can be manifested, for example, as tighter throttle pressure control during frequency regulation or temperature control during cycling. Other benefits may also accrue in the form of well-established design and analysis frameworks. A program is suggested which would demonstrate the applicability of multivariable techniques to power plant design while familiarizing the utiiity community with these techniques.

15620 (FE—1806-92) High-temperature turbine technology program turbine simulator tests with coal-derived low-Btu gas fuel. Horner, M.W. (General Electric Co., Schenectady, NY (USA). Gas Turbine Div.). Nov 1980. Contract AC01-76ET10340. 155p. NTIS, PC A08/MF A01.

A series of successful demonstrations of the IGCC system on a pilot plant scale have been conducted. The following conclusions are made: the advanced fixed-bed reactor is an effective and highly efficient converter of enthalpy as indicated by the high steam utilization, good cold-gas efficiency, and high average-gas quality; sulfur removal by the Benfield system met design goals and is sufficient to meet existing solid-fuel plant emissions specifications; there was no evidence of any operational problems with the Benfield (sulfur removal) system components; the average particulate loadings and alkali metal (Na + K) concentrations of the clean fuel gas confirm that a fixed-bed gasifier operating with a state-of-the-art, low-temperature cleanup system can supply fuel gas that can meet proposed commercial gas turbine specifications; air-cooled combustor components made with standard commercial alloys can be designed to operate efficiently at combustor exit temperature of 2700°F; combustor and fuel nozzle components can be designed to burn low-Btu fuel gas at fuel-to-air ratios of up to 0.5 with acceptable exit-gas temperature profiles, dynamic pressures, and operating stability; the water-cooled gas turbine composite nozzles can be operated successfully at nozzle inlet temperatures of 2670°F and 12 atmospheres; the water-cooled composite nozzle design is a successful concept with stable water flow distribution and is durable under severe test conditions; the total particulate loadings of low-Btu gas fuel are low enough to preclude any fouling of gas turbine airfoils by ash deposition; and although no corrosive deposits were detected and no indication of any corrosion on the water-cooled surfaces was found, it is almost certain that deposits would accumulate after longer operation times.

15621 (FE—2357-69) PFB coal-fired combined-cycle development program. Test evaluation report: CURL test series. (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). 1980. 187p. NTIS, PC A09/MF A01.

Under contract to the United States Department of Energy, the General Electric Company participated in the NCB/CURL 10 x 100 hour test at Leatherhead, England, in order to investigate corrosion and erosion of candidate gas turbine blade alloys for service in a Pressurized Fluidized Bed (PFB) combined-cycle power plant. The tests also permitted an evaluation of hot gas cleanup equipment. The results are encouraging, indicating that it is possible to provide materials which can withstand the erosive/corrosive PFB environment. Further, it was found that the reduction of particulate efflux via cyclones was sufficient to eliminate excessive erosion of gas turbine components in the stationary cascades tested. The tests also demonstrated the great care required to obtain accurate and consistent data measurement in certain areas. In particular, effluent characterization techniques require significant sophistication. Particle size distribution data indicated a high consistency of operation. On the other hand, difficulties were encountered in obtaining accurate and reliable indication of the alkali content of the exhaust gas. This was disappointing, since this is an important factor related to the tolerance levels of conventional gas turbine materials. Future testing efforts are recommended and defined.

15622 (NYSERDA—80-12) High-Temperature Combustion Gas Turbine Program. Rose, R.S. (General Electric Co., Schenectady, NY (USA). Gas Turbine Div.). Sep 1980. Contract AC01-76ET10340. 96p. NTIS, PC A05/MF A01.

This is the final report of the High-Temperature Combustion Gas Turbine Program conducted by the General Electric Company with the New York State Energy Research and Development Authority. This program was implemented to support the development of high-temperature gas turbines in New York State. The overall objective of this work is to enhance the ongoing national effort to develop a high-efficiency water-cooled gas turbine by addressing key technical aspects of that development. The specific objectives are to: investigate heat transfer, erosion, corrosion, and deposition characteristics of selected bucket internal cooling channel configurations; perform design analysis and fabricate part-scale turbine buckets having design features similar to those applicable to a full-scale heavy duty gas turbine; and perform design analysis and investigations related to the application of the above elements of work to a part-scale turbine development rig test and to a full-scale utility gas turbine test vehicle.

15623 (P—300-80-035) Facility repowering study. (California Energy Commission, Sacramento (USA)). Nov 1980. 345p. California Energy Commission, Sacramento, CA.

The economic, fuel, and environmental implications of repowering existing nonreheat, oil-fired electrical generating facilities in California with distillate fuels, and was extended by CEC staff to include coal-derived synthetic fuels are evaluated. California's older oil-fired power plants are very inefficient and repowering would significantly reduce the amount of oil burned to produce a unit of electrical energy at these facilities. Repowering would also add new generating capacity without requiring new sites. Specific power plants were categorized according to their potential for repowering. Between the initiation of the contract and the termination date, federal legislation was enacted (Power Plant and Industrial Fuel Use Act (PIFUA)), which effectively prohibits oil-based repowering. In order to make best use of the repowering work, CEC staff supplemented the study with analysis based upon replacing the distillate fuel for combustion turbine utilization with relatively clean-burning fuels derived from coal (i.e., methanol, SNG). This work concluded that 42 units statewide have good potential for repowering and would add greater than 5200 MW of new capacity at approximately $250/kW ($ 1977). For both distillate and synfuels repowering, emissions would decrease over the nonrepowered levels.

15624 (P—300-80-036) Assessment of advanced coal-based technologies for use in California. (California Energy Commission, Sacramento (USA)). Nov 1980. 299p. California Energy Commission, Sacramento, CA.

The objective of this five-task study was to evaluate the implications of coal use in California to generate electricity in terms of coal supply availability, rail transportation adequacy, potential public health problems, availability of advanced coal conversion technologies and review of pertinent out-of-state experience. This task assessed the potoential for the use of 24 advanced coal-to-electricity technology combinations in California. For each technology combination, the SO_2, NO/sub x/, and particulate emissions were estimated for both the fuel production and fuel-to-electricity conversion technologies. The capital and operating costs were estimated and levelized for a 35-year plant life. The uncertainties associated with these estimates were addressed, and both the cost and emissions estimates were normalized with respect to an advanced coal-fired power plant.

15625 Primary zone air proportioner. Cleary, E.N.G. (to Dept. of Energy). US Patent Application 140,947. 16 Apr 1980. 13p.

An air proportioner is provided for a liquid hydrocarbon fueled gas turbine of the type which is convertible to oil gas fuel and to coal gas fuel. The turbine includes a shell for enclosing the

turbine, an air duct for venting air in said shell to a gasifier, and a fuel injector for injecting gasified fuel into the turbine. The air proportioner comprises a second air duct for venting air from the air duct for mixing with fuel from the gasifier. The air can be directly injected into the gas combustion basket along with the fuel from the injector or premixed with fuel from the gasifier prior to injection by the fuel injector.

15626 **(AD-A—084515) Cascade ripple voltage generator.** Pekar, I.R. 20 Dec 1979. Translation of . USSR Patent 343,365. 8p. NTIS, PC A02/MF A01.

15627 **Application of a three-dimensional, simplified second-moment closure numerical model to study atmospheric effects of a large cooling-pond.** Yamada, T. (Argonne National Lab., IL). *Atmospheric Environment ;* **13**: 693-704(1979).

From AIAA/ASME thermophysics and heat transfer conference; Palo Alto, CA, USA (24 May 1978).

Cooling ponds receive large amounts of waste heat from power generation or industrial sources and release sensible and latent heat to the atmosphere. These area sources of relatively warm moist air may have significant inadvertent effects on the local environment. This paper is a preliminary step in the development of a method for estimating the atmospheric perturbations produced by a cooling pond. A three-dimensional numerical model based on turbulence second-moment closure equations and Gaussian cloud relations has been developed. A simplified version of the model, in which only equations for turbulence energy and a master length scale are solved prognostically, is used. Numerical simulations, using as boundary conditions the data from a cooling pond study conducted in northern Illinois, are compared qualitatively with observations.

15628 **Conversion of condensing steam turbines for remote base load heat supply for district heating systems.** Kirvelae, K. (EKONO, Helsinki, Finland). pp 23p, Section 8 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

Conversion of power stations located in or close to cities to combined heat and power generation is described as an excellent way to continue their active lifetime of still useful power production capacity. Thermodynamic principles are reviewed. Basic alternatives for conversion, plant characteristics, theoretical and actual heat recovery, and cost of transmitted heat energy are discussed. Examples on converting conventional small and medium sized turbine units as well as nuclear plants in Finland, Central Europe, and North America are cited. (MCW)

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REFER ALSO TO CITATION(S) 15627, 16115, 16116

15629 **(AD-A—084370) National Dam Safety Program. Middle Fork Slurry Impoundment (ID No. VA-16708), Tennessee River Basin, Middle Fork of Dumps Creek, Russell County, Virginia. Phase I inspection report. Final report.** Martin, R.E. (Schnabel Engineering Associates, Richmond, VA (USA)). Mar 1980. Contract DACW65-79-D-0004. 75p. NTIS, MF A01.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of Phase I investigation; however, the investigation is intended to identify any need for such studies. Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirement of additional indepth study when necessary. Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

15630 **(ADL—81231-03) Effect of phased FGD implementation on power costs.** (Little (Arthur D.), Inc., Cambridge, MA (USA)). Jan 1979. Contract AC01-78PE02529. 5p. NTIS, PC A02/MF A01.

This addendum to cost comparison of one-step versus phased or 3-step installation of scrubbers for fossil-fuel power plants examines the effect of accelerated depreciation and investment tax credits on the levelized revenue requirement, and whether the utility will prefer the phased approach in its investment decision on the basis of discounted case flows. The levelized revenue requirements show that the one-step approach has a higher present value of cash flows than the phased approach at returns below 11.5%. At about 11.5%, the present values of cash flows are equal and the two alternatives would be equivalent on a cash flow basis. Since utilities cannot ordinarily earn inflation-free returns in the range of 11%, this analysis suggests that a utility would achieve a more favorable cash flow for the single-step installation if all of the FGD system capital costs could be incorporated in the rate base as assumed here. Thus, there are trade-offs to be considered - power costs, energy (coal) consumption, returns to utilities, and SO_2 emissions. In terms of SO_2 emissions control, the phased approach would result in about 75% of the cumulative SO_2 removal achieved with the one-step installation over the life of the plant. (LCL)

15631 **(EPRI-CS—1669) Kramer station fabric filter evaluation. Final report.** Ensor, D.S.; Cowen, S.; Shendrikar, A.; Markowski, G.; Woffinden, G. (Meteorology Research, Inc., Altadena, CA (USA); Stearns-Roger, Inc., Denver, CO (USA)). Jan 1981. 282p. NTIS, PC A13/MF A01.

This report presents the results of an extensive evaluation of the fabric filtration system (baghouses) located at the Kramer Station of the Nebraska Public Power District. These retrofit units represent the first baghouse application to western low-sulfur, subbituminous, pulverized coal-fired utility boilers. The performance evaluation emphasized fine particulate and trace element removal, but also included an engineering and economic analysis. The emission characterization consisted of a three phase field performance test program including (1) baghouse as-found tests; (2) diagnostic tests to determine an improved baghouse cleaning cycle; and (3) fine particle - trace element emission evaluations with a preferred cleaning cycle in effect. The overall collection efficiency with the preferred cleaning cycle at full load ranged from 99.8 to 99.9 percent, with associated outlet particle emissions of less than 0.003 lb/10^6 Btu. The stack plume was invisible during all tests with a typical measured opacity of 0.07 percent. These emissions are well below the current EPA particulate matter new source performance standards (NSPS) of 0.03 lb/10^6 Btu and 20 percent opacity for coal-fired utility boilers. The capital cost was $141/gross Kw (1979 dollars). The operating costs were estimated to be 2.039 mills/Kwh (four-year bag life) at a 69 percent capacity factor. The on-line reliability of the units tested exceeded 99 percent for a 15-month evaluation period beginning 6 months after startup.

15632 **(FE—2357-70(Vol.A)) Advanced cleanup device performance design report (Task 4.3). Volume A. Cyclone theory and data correlation.** (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). Jan 1981. Contract AC21-76ET10377. 123p. NTIS, PC A06/MF A01.

The 100-year-old cyclone is perhaps the best known and least expensive method of gas particulate cleaning. The theory and practice of cyclone operation has been extensively documented. The body of experience indicates that small cyclones operated at high swirl velocity give better separative efficiency although consideration must also be given to coarse particle bouncing and limitations associated with system pressure losses and cyclone erosion. Hence, multicyclones (i.e., many small cyclones operating in paral-

lel), and staging have been employed in situations where unusually clean gas is mandated. Despite the extensive body of literature on the subject, predicting the performance of cyclones in actual service remains an art. The inadequacies in the existing cyclone theories quickly became evident in the course of several experimental programs at GE using various cyclone designs. The most significant finding of this work has been the observation that electrostatic forces could enhance, or, in fact, dominate the separation process. Cyclone separative efficiencies, with natural electrostatic effects present, were found to be independent of flowrate or even to improve at low flowrates, completely contrary to any of the existing cyclone literature. By implication, it is also possible that such electrostatic forces could influence cyclone scaling so that large cyclones employed in the cleanup train may not suffer the performance degradation compared to small cyclones, as projected from conventional inertial theory. Much of the GE work has therefore been oriented toward understanding and augmenting these electrostatic effects. This report is a collection of the most significant papers and memos on cyclone performance generated during the past three years by General Electric under the CFCC program.

15633 **(MLM—2810) Assessment of the radiological impact of coal utilization. II. Radionuclides in western coal ash.** Styron, C.E.; Bishop, C.T.; Casella, V.R.; Jenkins, P.H.; Yanko, W.H. (Mound Facility, Miamisburg, OH (USA)). 3 Apr 1981. Contract AC04-76DP00053. 177p. NTIS, PC A09/MF A01.

A project has been initiated at Mound Facility specifically to evaluate the potential radiological impact of coal utilization. Phase I of the project included a survey of western US coal mines and an assessment of emissions from a power plant burning Western coal. Concentrations of uranium in coal from operating Western mines were slightly below the national average and roughly comparable to Eastern coal. Environmental deposition of radionuclides from stack emissions over a 20-year accumulation at a power plant burning Western coal was estimated to be 0.1 to 1.0% of measured background. Phase II of the project, the subject of the present report, has involved an interlaboratory comparison of results of radioanalytical procedures, determining partitioning coefficients for radionuclides in bottom ash and fly ash, and an assessment of the potential for migration of radionuclides from ash disposal sites. Results from the various laboratories for uranium-238, uranium-234, thorium-230, radium-226, polonium-210, thorium-232, thorium-228, and uranium-235 were generally in very good agreement. However, values for lead-210 in coal varied widely. Essentially all the nonvolatile radionuclides (uranium, radium, and thorium) from feed coal were accounted for in fly ash and bottom ash. However, 20 to 50% of the volatile radionuclides (lead and polonium) from subbituminous and lignitic coals could not be accounted for in ash, and it is assumed that this fraction exits via the stack. At the power plant burning bituminous coal, essentially all the lead and most of the polonium remained with the ash.

15634 **(P—700-81-001) Opportunities for new coastal power plants in California: staff draft.** (California Energy Commission, Sacramento (USA)). Jan 1981. 201p. California Energy Commission, Sacramento, CA.

Opportunities for the location of new power plants in California's coastal zone were examined. Of approximately 200 California Coastal Commission (CCC) and San Francisco Bay Conservation and Development Commission (BCDC) undesignated areas (UAs), 13 were identified a potential power plant sites. The opportunities identified may potentially provide 4500 to 6000 MW of generation capacity to support the state's projected need for development of electrical generating capacity. The major prohibition to coastwide opportunities is the effect of ambient air quality standards on the pervasive rugged coastal terrain. A serious constraint to opportunities of the 13 remaining undesignated areas described is the effect of cooling water system entrainment and thermal discharges on marine and estuarine biological resources. CEC staff concludes that there are reasonable opportunities for both base load and peaking capacity additions on the coast through the year 2000 and that no changes to CCC and BCDC designated areas are required at this time.

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15635 **(DOE/ET/29068—T4) Evaluation, design, development, and delivery of a 1200-kV prototype termination. Eighth technical progress report, September 1-November 30, 1980.** Billings, J.S.; Meyer, J.R.; Kolano, F.J. (Westinghouse Electric Corp., Trafford, PA (USA). Power Circuit Breaker Div.). 20 Feb 1981. Contract AC01-78ET29068. 36p. NTIS, PC A03/MF A01.

Tests are continuing on the shatter-resistant weathercase models and small samples. Extensive studies of composite materials has resulted in characterization of the epoxy weathercase materials mechanical properties over a wide range of temperatures and lifetime. Progress is reported on the design of the full scale prototype termination.

15636 **(LA-UR—81-582) 100-kV, 2-ns risetime, dc-coupled probe.** Power, J.; Nunnally, W.; Young, D. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 8p. (CONF-810325—3). NTIS, PC A02/MF A01.

From Workshop on measurement of electrical quantities in pulsed power systems; Boulder, CO, USA (2 Mar 1981).

A high-voltage probe has been designed and constructed; it is unique because it may be used for both high-voltage dc and for transient measurements. The probe is rated at 100-kV dc with a short transient rating of 150-kV peak. System risetime is less than 2 ns. The input impedance is 1000 MΩ shunted by 13 pF. A distributed RC network providing the desired attenuation is housed in a 25.4-cm-dia cylindrical housing. A 15.2-m length of coaxial cable connects the probe to a termination network at the oscilloscope input. The oscilloscope input impedance must be at least 100 kΩ to maintain the correct dc attenuation ratio.

15637 **(SAND—80-2457C) Varistor-initiated arcs in lightning arrestor connectors.** Brainard, J.P.; Andrews, L.A.; Anderson, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810510—3). NTIS, PC A02/MF A01.

From Electronic components conference; Atlanta, GA, USA (11 May 1981).

The electrical breakdown of gas-filled gaps is currently being used in Lightning Arrestor Connectors. The Lightning Arrestor Connector (LAC) is a combination connector and high-current transient suppressor where an overvoltaged signal is shunted from the connector contacts to the connector shell, thus protecting downstream circuitry. Control of the breakdown voltage is difficult, relying on electrode spacing and surface conditions, and the gas composition and pressure. The breakdown control using solid state devices such as a zener diode or a varistor would be far superior, but the current carrying capacity is greatly reduced. A varistor-initiated gas breakdown gap has been developed which has excellent breakdown control and can handle much higher currents than would be possible from the solid-state conduction of the varistor alone. The varistor-initiated arc concept involves the surface flashover of a doped sintered zinc oxide varistor. The varistor-initiated arc LAC is simple in design and easy to produce.

15638 **Transient stability enhancement of electric power generating systems by 120-degree phase rotation.** (to Dept. of Energy). US Patent Application 148,863. 12 May 1980. 22p.

A method and system for enhancing the transient stability of an intertied three-phase electric power generating system. A set of power exporting generators is connected to a set of power importing generators. When a transient cannot be controlled by conventional stability controls, and imminent loss of synchronism is detected (such as when the equivalent rotor angle difference between the two generator sets exceeds a predetermined value, such as 150 degrees), the intertie is disconnected by circuit breakers. Then a switch having a 120-degree phase rotation, or a circuit breaker having a 120-degree phase rotation is placed in the intertie. The intertie is then reconnected. This results in a 120-degree reduction in the equivalent rotor angle difference between the two generator sets, making the system more stable and allowing more time for the conventional controls to stabilize the transient.

15639 Self-monitoring high voltage transmission line suspension insulator. (to Dept. of Energy). US Patent Application 148,322. 9 May 1980. 11p.

A high voltage transmission line suspension insulator which monitors its own dielectric integrity is described. A dielectric rod has one larger diameter end fitting attachable to a transmission line and another larger diameter end fitting attachable to a support tower. The rod is enclosed in a dielectric tube which is hermetically sealed to the rod's end fittings such that a fluidtight space is formed between the rod and the tube. A pressurized dielectric liquid or gas is placed within that space. A discoloring dye placed within this space, or a pressure gauge, is used to detect the loss of the pressurized fluid.

15640 Power response requirements for electric utility generating units. Ewart, D.N.; Dawes, M.H.; Schulz, R.P.; Brower, A.S. (GE, Schenectady, NY). *Proceedings of the American Power Conference ;* **40**: 1139-1150(1978).

Over the past few years, there has developed an increasing awareness of the importance of the overall response performance of power generation units in operation on the interconnected electric utility systems in the United States. This paper discusses plant response requirements, with emphasis on specific capability for regulating duties under both normal and abnormal operating conditions. The report begins with a review of the current operating principles in United States utility interconnections. It discusses the specific requirements placed on units under normal operating conditions, following loss of generation in the interconnection, and under system emergency conditions. Finally, requirements for operation of baseload, intermediate, and peaking-load plants are summarized. 11 refs.

21 NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 15482, 15743

15641 (DOE/EIA—0201/13) Federal support for nuclear power: reactor design and the fuel cycle. Energy policy study. Volume 13. (Department of Energy, Washington, DC (USA). Energy Information Administration). Feb 1981. 74p. NTIS, PC A04/MF A01.

This paper analyzes five categories of programs relevant to the past and future development of nuclear power: research and development on reactor design and related topics; US support for international nuclear programs and promotion of exports of nuclear powerplants; Federal purchases of uranium and related programs; Federal ownership and operation of nuclear fuel enrichment services; and waste disposal programs. The programs included in each of these areas is identified and their evolution described. The final chapter summarizes the discussion in terms of economic categories relevant to an assessment of the importance of the programs covered for the past and future development of the nuclear power industries.

15642 (ORNL—5725, pp 7.1-7.6) **Energy model validation.** Dec 1980.

In Engineering Physics Division progress report for period ending November 30, 1980.

In energy model validation the Engineering Physics Division has entered into an area of research in which techniques developed for nuclear research, in particular, sensitivity analysis, are being applied to nonnuclear problems. An approach is developed to evaluate computer codes that have been developed for energy-economic modeling, and that approach is applied to the Long Term Energy Analysis Package (LEAP) of the DOE Energy Information Administration (EIA). LEAP is an energy model that is currently being used by EIA to make projections of possible energy futures with emphasis on the period 1995 to 2020. The model's main function is to allocate supplies of various technologies for an essentially fixed demand. The results are intended to guide R and D decisions for new technologies.

15643 Nuclear power, a current IAEA perspective. Skjoeldebrand, R. (International Atomic Energy Agency, Vienna (Austria)). *Gensan Nenji Taikai Gijiroku ;* No. 12, 32-42(1979). (In Japanese).

From 12. annual conference of the Japan Atomic Industrial Forum; Tokyo, Japan (13 - 15 Mar 1979).

It is clear that nuclear power generation is at the turning point at present, and its future is very uncertain. Though it was proved that nuclear reactors have matured sufficiently and are safe, and the excellent result of nuclear power generation have been obtained, the actual state is as mentioned above. At the end of 1978, 228 power reactors were in operation in the world, and the generating capacity was 110 million kWe. The role of nuclear power generation is expected to increase in future in view of the increase of demand of energy resources, the state of development of energy-saving measures and the energy demand of developing countries in future. About 1400 million kWe of nuclear power generation is predicted by 2000. The uncertainty of nuclear power generation is attributed to the environment of investment, the revision of permission and approval conditions, the dependence upon the large margin of generating capacity caused by the long lead time and the slow growth of demand, the considerations of nuclear proliferation, and the movement against nuclear energy. The order of nuclear power plants decreased rapidly recently, and the order of about 20 million kWe has been canceled since 1975. The activities of INFCE and the participation of IAEA in the INFCE and other IAEA perspective are discussed.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 15663, 15687, 15701, 15702, 15707

15644 Nuclear reactor cooling system decontamination reagent regeneration. Anstine, L.D.; James, D.B.; Melaika, E.A.; Peterson, J.P. Jr. (to Dept. of Energy). US Patent Application 156,945. 6 Jun 1980. 18p.

An improved method for decontaminating the coolant system of water-cooled nuclear power reactors and for regenerating the decontamination solution is described. A small amount of one or more weak-acid organic complexing agents is added to the reactor coolant, and the pH is adjusted to form a decontamination solution which is circulated throughout the coolant system to dissolve metal oxides from the interior surfaces and complex the resulting metal ions and radionuclide ions. The coolant containing the complexed metal ions and radionuclide ions is passed through a strong-base anion exchange resin bed which has been presaturated with a solution containing the complexing agents in the same ratio and having the same pH as the decontamination solution. As the decontamination solution passes through the resin bed, metal-complexed anions are exchanged for the metal-ion-free anions on the bed, while metal-ion-free anions in the solution pass through the bed, thus removing the metal ions and regenerating the decontamination solution.

15645 Reevaluation of the feasibility of stainless-steel cladding for LWR applications. Eckart, L.; Christenson, J. (Univ. of Cincinnati, OH). *Transactions of the American Nuclear Society ;* **34**: 354(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 15414, 15644, 15645, 15652, 15662, 15663, 15687, 15700, 15701, 15702, 15707, 15709

15646 (K/CSD/TM—39) FILLGEN: fill table generator for RELAP4. Teague, J.W. II. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Mar 1981. Contract W-7405-ENG-26. 30p. NTIS, PC A03/MF A01.

FILLGEN is a computer program which produces time-dependent boundary condition fill tables in a format consistent with the input requriements for RELAP4, a transient thermal-hydraulic analysis code for PWR systems. These fill tables consist of mass flux and enthalpy data selected according to user input from a dataset produced by AMICON, an interpretative code for two-phase flow instrumentation.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 15181, 15817

15647 (DOE/SF/02034—T12) High-temperature gas-cooled reactor steam cycle/cogeneration application study. (Gas-Cooled Reactor Associates, La Jolla, CA (USA)). Dec 1980. Contract AC03-78SF02034. 336p. NTIS, PC A15/MF A01.

This HTGR-SC/C Application Study documents the effort to evaluate the appropriateness of the HTGR-SC/C as the Lead Project. The scope of this effort includes the evaluation of the HTGR-SC/C technology, the evaluation of potential HTGR-SC/C markets, the assessment of the economics of commercial HTGR-SC/C plants, and the evaluation of the program and expenditures necessary to establish HTGR-SC/C technology through the completion of the Lead Project. Further, the value of the HTGR-SC/C Lead Project in the support of advanced applications such as the HTGR-R is also addressed. The HTGR-SC/C was considered as a Lead Project candidate in two configurations: a 2240-MW(t) base-load electric plant and an 1170-MW(t) cogeneration plant that provides electricity and process steam.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 15664, 15665, 15697, 15699, 15703, 15705, 15708, 15728

15648 (DOE/ET/37240—85) Coolant mixing in LMFBR rod bundles and outlet plenum mixing transients. Progress report. Todreas, N.E.; Golay, M.W.; Wold, L. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering). Feb 1981. Contract AS02-76ET37240. 59p. NTIS, PC A04/MF A01.

Four tasks are reported on: bundle geometry (wrapped and bare rods), subchannel geometry (bare rods), LMFBR outlet plenum flow mixing, and theoretical determination of local temperature fields in LMFBR fuel rod bundles. (DLC)

15649 (DOE/ET/37240—89) Coolant mixing in LMFBR rod bundles and outlet plenum mixing transients. Progress report, September 1, 1980-November 30, 1980. Todreas, N.E.; Golay, M.W.; Wolf, L. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering). Feb 1981. Contract AS02-76ET37240. 75p. NTIS, PC A04/MF A01.

Four tasks are reported: bundle geometry (wrapped and bare rods), subchannel geometry (bare rods), subchannel geometry (bare rods), LMFBR outlet plenum flow mixing, and theoretical determination of local temperature fields in LMFBR fuel rod bundles. (DLC)

15650 Cladding dimensional changes in mixed-oxide fuel pins. Makenas, B.J.; Jost, J.W.; Hales, J.W. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 256-257(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15651 (NUREG/CR—0808) Corrosion adequacy of the 2 1/4 CR-1Mo steel for LMFBR steam generation system service. Critical literature survey. Zima, G.E. (Battelle Pacific Northwest Labs., Richland, WA (USA)). May 1980. 72p. (PNL—2795). NTIS, PC A04/MF A01.

The focus of this review is on the long-term serviceability of 2 1/4-1 Mo steel under the waterside environmental conditions presented in the steam generator of an LMFBR commercial scale plant. The basic question related to material behavior is to what extent the water side physico-chemical environment will affect the favorable performance of a given material under operating experience. In present light water reactors, the steam generator corrosion problems in part are attributable to complex interactions between the localized secondary environment and the mechanical design of the components (i.e., tube/tube support crevice, tube/tubesheet crevice, flow pattern, etc.) in the steam generating system.

15652 (ORNL—5725, pp 6.1-6.54) Analyses for specific systems or applications. Dec 1980.

In Engineering Physics Division progress report for period ending November 30, 1980.

The analyses performed by the Division for specific systems or applications continue to reflect the diversified interests of the sponsoring agencies. The majority of the effort was directed toward the Liquid Metal Fast Breeder Reactor, the Gas Cooled Reactor, and the Magnetic Fusion Energy programs. Significant levels of effort were also directed toward high-energy physics calculations, primarily for charged particles, and for light water reactor investigations, including analysis of specific aspects of the Three Mile Island accident and the investigation of a dual-purpose power and water level gamma thermometer. Other areas of investigation included the molten salt reactor, non-destructive fuel assay, and weapons radiation transport calculations for the Defense Nuclear Agency.

15653 Reactor vessel support system. Golden, M.P.; Holley, J.C. (to Dept. of Energy). US Patent Application 148,323. 9 May 1980. 9p.

A reactor vessel support system includes a support ring at the reactor top supported through a box ring on a ledge of the reactor containment. The box ring includes an annular space in the center of its cross-section to reduce heat flow and is keyed to the support ledge to transmit seismic forces from the reactor vessel to the containment structure. A coolant channel is provided at the outside circumference of the support ring to supply coolant gas through the keyways to channels between the reactor vessel and support ledge into the containment space.

15654 Observations of cesium migration effects in mixed-oxide fuel pins. Nayak, U.P.; Levine, P.J. (WARD, Madison, PA). *Transactions of the American Nuclear Society ;* **34**: 258-259(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15655 Solidus studies on thorium-base metal fuel alloys. Hins A.G.; Domagala, R.F.; Schmitt, D.R.; Thresh, H.R. (Argonne National Lab., IL). *Transactions of the American Nuclear Society ;* **34**: 260-261(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15656 Final design analyses of CRBRP fuel rod. Bishop, B.A.; Vijuk, R.M. (WARD, Madison, PA). *Transactions of the American Nuclear Society ;* **34**: 263-265(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15657 Ground rules and criteria for the CDS reactor core design. Levitt, L.B. (Atomics International Div., Canoga Park, CA); Felten, L.D.; Ostermier, B.J.; Biancheria, A. *Transactions of the American Nuclear Society ;* **34**: 265-266(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15658 Universal LMFBR core layout. Doncals, R.A.; Paik, N.C.; Rathbun, R.W.; Varner, S.K.; Petras, D.S. (WARD, Madison, PA). *Transactions of the American Nuclear Society ;* **34**: 266-268(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15659 Orificing interchangeable LMFBR cores. Carelli, M.D.; Bach, C.W. (WARD, Madison, PA). *Transactions of the American Nuclear Society ;* **34**: 268-270(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15660 **Interchangeable core assembly design.** Bishop, B.A.; Schwegler, E.C.; Vijuk, R.M. (WARD, Madison, PA). *Transactions of the American Nuclear Society ;* **34**: 270-271(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15661 **Blanket design considerations for fast reactor oxide fuel systems.** Garkisch, H.D. (WARD, Madison, PA). *Transactions of the American Nuclear Society ;* **34**: 271-272(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 15698

2108 Economics

REFER ALSO TO CITATION(S) 15728

15662 **(WFPS-TME—80-016) Feasibility of recycling thorium in a fusion-fission hybrid/PWR symbiotic system.** Josephs, J.M. (Cornell Univ., Ithaca, NY (USA). School of Applied and Engineering Physics; Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.). 31 Dec 1980. Contract AC02-77ET51010. 54p. NTIS, PC A04/MF A01.

A study was made of the economic impact of high levels of radioactivity in the thorium fuel cycle. The sources of this radioactivity and means of calculating the radioactive levels at various stages in the fuel cycle are discussed and estimates of expected levels are given. The feasibility of various methods of recycling thorium is discussed. These methods include direct recycle, recycle after storage for 14 years to allow radioactivity to decrease, shortening irradiation times to limit radioactivity build up, and the use of the window in time immediately after reprocessing where radioactivity levels are diminished. An economic comparison is made for the first two methods together with the throwaway option where thorium is not recycled using a mass energy flow model developed for a CTHR (Commercial Tokamak Hybrid Reactor), a fusion-fission hybrid reactor which serves as fuel producer for several PWR reactors.

2109 Process Heat Reactors

REFER ALSO TO CITATION(S) 15181, 15647

15663 **(ORNL/TM—7190) Source book for planning nuclear dual-purpose electric/distillation desalination plants.** Reed, S.A. (Oak Ridge National Lab., TN (USA)). Feb 1981. Contract W-7405-ENG-26. 99p. NTIS, PC A05/MF A01.

A source book on nuclear dual-purpose electric/distillation desalination plants was prepared to assist government and other planners in preparing broad evaluations of proposed applications of dual-purpose plants. The document is divided into five major sections. Section 1 presents general discussions relating to the benefits of dual-purpose plants, and spectrum for water-to-power ratios. Section 2 presents information on commercial nuclear plants manufactured by US manufacturers. Section 3 gives information on distillation desalting processes and equipment. Section 4 presents a discussion on feedwater pretreatment and scale control. Section 5 deals with methods for coupling the distillation and electrical generating plants to operate in the dual mode.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 15704, 15706, 16269

15664 **(ORNL—5725, pp 3.1-3.101) Nuclear cross-section processing, testing, and sensitivity analysis.** Dec 1980.

In Engineering Physics Division progress report for period ending November 30, 1980.

The MINX-AMPX multigroup cross-section processing systems have been upgraded through the updating of the individual modules to reflect state-of-the-art technology. The Data Library Collection (DLC) of processed and tested multigroup cross sections in the Radiation Shielding Information Center (RSIC) continues to expand, with both fine-group and broad-group cross-section sets being made available to requesters. The first phase of an update of VITAMIN-C, denoted as VITAMIN-E and based on ENDF/B-V data, has become available and been tested against CSEWG benchmarks. Multigroup sensitivity profiles and covariance matrices for group cross sections and for fission spectrum parameters are now a part of RSIC's DLC, with several sets available for fast- and thermal-reactor benchmarks and for fast-reactor shielding benchmarks. The ORNL FORSS sensitivity and uncertainty analysis system has now been documented and packaged for distribution through RSIC. One of the major recent applications of sensitivity and uncertainty analysis has been the estimation of the uncertainty in the breeding ratio of a large LMFBR. Others include an extensive analysis of the Coupled Fast Reactivity Measurement Facility (CFRMF) and the design and sensitivity analysis of a CDS-type LMFBR Heterogeneous Core. An advanced uncertainty analysis methodology for transient nonlinear systems was developed and successfully applied to the analysis of a blowdown thermal hydraulics problem. A FORSS analysis of the National Bureau of Standards Intermediate Energy Standard Neutron Field (NBS-ISNF) was performed. The 66 items in this section consist of abstracts of papers and reprints of contributions to the Transactions of the American Nuclear Society, which were indexed from the complete document. (RWR)

15665 **(ORNL/TM—7634) Validation tests of the venture finite-difference diffusion theory neutronics code.** Vondy, D.R.; Fowler, T.B. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 18p. NTIS, PC A02/MF A01.

The VENTURE code has been programmed for digital computer neutronics calculations. This report discusses the testing done to prove that reliable solutions are obtained. Some of the results produced and discussion about them may be of general interest, especially in application for reactor analysis. The authors believe that the extensive testing done with this code allows a high level of confidence to be placed on results produced if due consideration is given to limits of the model, to discrete mesh requirements, to basic requirements for adequate nuclear properties, and to satisfying adequate convergence criteria for the iterative procedures of solution.

15666 **Simple monotonic interpolation scheme.** Greene, N.M. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society ;* **34**: 299-300(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15667 **ORIGEN2: a revised and updated version of ORIGEN.** Croff, A.G. (Oak Ridge National Lab., TN). *Transactions of the American Nuclear Society ;* **34**: 349-350(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15668 **Physics performance of a centrally moderated fast reactor concept.** Shenoy, S.K. (Brookhaven National Lab., Upton, NY); Mathews, D.; Durston, C.; Cerbone, R.J. *Transactions of the American Nuclear Society ;* **34**: 358-359(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

2202 Components And Accessories

REFER ALSO TO CITATION(S) 15815, 15821

15669 (DOE/ET/13511—T6) Development of automated welding process for field fabrication of thick walled pressure vessels. [First quarterly report, FY 1981]. Schneider, U.A. (Westinghouse Electric Corp., Tampa, FL (USA). Nuclear Equipment Div.). 1981. Contract AC05-78ET13511. 14p. NTIS, PC A02/MF A01.

The choice of sets of root welding parameters is discussed. Thick field demonstration/qualification welds will be performed. A welding procedure handbook which will be prepared is mentioned. (DLC)

15670 (NUREG/CR—1346) Advanced Two-Phase Flow Instrumentation Program quarterly progress report for October-December 1979. Turnage, K.G.; Davis, C.E.; Anderson, R.L.; Miller, G.N. (Oak Ridge National Lab., TN (USA)). May 1980. 41p. (ORNL/NUREG/TM—382). NTIS, PC A03/MF A01.

A primary objective of the Advanced Two-Phase Flow Instrumentation (ATPI) Program is to develop reliable coolant level sensors for in-core use in light-water power reactors. Two concepts are being pursued concurrently: heated thermocouple (HTC) arrays and ultrasonic techniques. Detectors are being designed, fabricated, and tested before proceeding to the design of prototype instruments for in-core or in-reactor use. The emphasis of this task is to develop reliable level detectors which can be retrofitted into existing plants and incorporated into new reactor design. A feasibility study of the use of an enhanced vortex shedding flowmeter for making measurements in two-phase flow is concluded that the vortex shedding mechanism is severely limited for two-phase flow application.

15671 (NUREG/CR—1361) Drag devices for two-phase mass flow measurements. Anderson, J.L. (EG and G, Inc., Albuquerque, NM (USA)). May 1980. 58p. (EGG—2025). NTIS, PC A04/MF A01.

Results are presented from testing a number of full-flow drag devices in steady-state air-water mixtures and transient steam-water mixtures for the purpose of obtaining two-phase mass flow measurements. Modeling methods for obtaining mass flow rates are discussed, along with the effects of two-phase flows on the drag coefficient of full-flow, multihole drag plates. Test results indicate that for applications in small piping, a multihole drag plate with a flow blockage of 23% provided the greatest accuracy of the devices tested, resulting in a normalized standard deviation of 2.5% for two-component mixtures. For low density, high velocity flows (such as all gas and annular mist flows) the drag coefficient of the drag device increased from its constant all water value, reflecting the effects of compressibility. Results are presented for eight different drag devices tested in air-water mixtures. Transient steam-water tests were performed to assess the transient performance of a prototype drag plate and to determine with what accuracy the mass exiting the system could be measured. Results from four partial blowdown tests are presented.

15672 (ORNL—5725, pp 5.1-5.24) **Development of methods for shield and reactor analyses.** Dec 1980.

In Engineering Physics Division progress report for period ending November 30, 1980.

Methods development work in the Division continues in the shielding area (discrete ordinates and Monte Carlo) and in the reactor analysis area, primarily with the VENTURE system. An interesting new effort is directed toward depletion perturbation theory for reactor burnup analysis. A new version of the basic two-dimensional discrete ordinates code, DOT 4.3, has been developed and is now undergoing testing and documentation. This code includes diffusion acceleration, and has improved convergence rates and adaptability to non-IBM computers. An international review of Monte Carlo codes included ORNL experience with the French TRIPOLI code as well as the ORNL MORSE code. The core analysis package based around the VENTURE three-dimensional diffusion theory neutronics code now includes depletion and fuel management capability. The accurate computation of resonance reaction rates in heterogeneous reactor lattices is one of the most challenging problems in LWR physics. Under EPRI sponsorship a new methodology (i.e., OZMA) was developed for solving the point-energy integral or discrete ordinates transport equations on a dense energy grid as required to handle resonance profiles. The new approach eliminates simultaneously most of the approximations involved in simple treatments of resonance shielding, and the statistical problems inevitable in Monte Carlo calculations.

15673 (NE-M—3-33T(Rev.)(1-81)) Nuclear standard: 2 1/4%-chromium, 1%-molybdenum alloy steel seamless tubes (ASME SA-213 with additional requirements). (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Jan 1981. 11p. Nuclear Standards Management Center, Oak Ridge, TN.

This standard covers 2 1/4%-chromium, 1%-molybdenum alloy steel seamless tubes for use in heat exchangers and steam generators for nuclear and associated applications.

15674 (NE-F—2-4(L)(Amend.)(1-81)) Quality verification program requirements. (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Jan 1981. 13p. National Standards Management Center, Oak Ridge, TN.

This revision supersedes the December 1974 issue of RDT-F-2-4T. It sets forth mandatory and optional requirements for a contractor to verify that items or services conform to specified quality requirements of the contract. The quality verification program which is described comprises the elements of an inspection system, including planning, organization, identification, and control of items and services. (DLC)

15675 (LA-tr—80-40) Documentation of the valve model in DAPSY. Schillitz, J.; Seel, H.R. (Los Alamos Scientific Lab., NM (USA)). Dec 1980. Translation of GRS-A-247, December 1978. 26p. NTIS, PC A03/MF A01.

The more advanced valve model in the DAPSY program couples valve dynamics with fluid dynamics. The valve is then given a universal description. With this program, the closing behavior of internal-medium-operated as well as internal-medium-controlled valves can be simulated, e.g., steam isolating valves (DIV) and feed-water return valves (SRV valves). This report, which supplements the documentation of the DAPSY program, presents a description of the expanded possibilities for using DAPSY and summarizes the user's instructions necessary for this. These studies were performed as part of the SR 122 research project in further development of the DAPSY program.

15676 (ANL-Trans—1191) Study on fluidelastic vibration of tube bundle. Tanaka, H. Translated from *Nippon Kikai Gakkai Ronbunshu, B Hen ;* **46**: No. 408, 1398-1407(Aug 1980). 23p. NTIS, PC A02/MF A01.

Large numbers of fluid apparatus that employ tube bundles are used in various types of plants such as boilers and nuclear steam generators. Recently, however, the capacity of such equipment has been increased, one result of which is that, with the greater quantity and velocity of flow, the occurrence of accidents due to the vibration of the cylinder bundles that make up these apparatus has become considerable. Since the vibration damage of pipes results in serious accidents that can lead to the functional interruption of an entire plant, the prevention of cylinder bundle vibration is an extremely important matter. A variety of causes for the vibration of bodies due to aerodynamic forces are conceivable, one of which is fluidelastic vibration.

15677 Availability of redundant safety systems with common-mode and undetected failures. Vaurio, J.K. (Argonne National Lab., IL (USA). Reactor Analysis and Safety Div.). *Nuclear Engineering and Design ;* **58**: No. 3, 415-424(Jun 1980).

The engineered safety features of nuclear power plants contain redundant standby safety systems that are tested periodically to ensure their operability should an emergency occur. Analytical equations are developed in this paper for the unavailability of common m-out-of-n systems, taking into account common-cause failures and failures that are not detectable by regular periodic tests. Consecutive, random and staggered testing schemes are considered.

The unavailability model for individual components includes separate downtime contributions due to testing, hardware failures, human testing and repair errors as well as failures caused by true demands. Computer codes have been developed to incorporate these failure modes in the unavailability analysis. The parameters of the model are estimated from documented field data, and typical systems are analyzed to illustrate the methods and the significance of common-mode failures.

15678 **Method for monitoring irradiated fuel using Cerenkov radiation.** Dowdy, E.J.; Nicholson, N.; Caldwell, J.T. (to Dept. of Energy). US Patent Application 151,870. 21 May 1980. 12p.

A method is provided for monitoring irradiated nuclear fuel inventories located in a water-filled storage pond wherein the intensity of the Cerenkov radiation emitted from the water in the vicinity of the nuclear fuel is measured. This intensity is then compared with the expected intensity for nuclear fuel having a corresponding degree of irradiation exposure and time period after removal from a reactor core. Where the nuclear fuel inventory is located in an assembly having fuel pins or rods with intervening voids, the Cerenkov light intensity measurement is taken at selected bright sports corresponding to the water-filled interstices of the assembly in the water storage, the water-filled interstices acting as Cerenkov light channels so as to reduce cross-talk. On-line digital analysis of an analog video signal is possible, or video tapes may be used for later measurement using a video editor and an electrometer. Direct measurement of the Cerenkov radiation intensity also is possible using spot photometers pointed at the assembly.

15679 **Passive self-cleaning aerosol scrubber.** (to Dept. of Energy). US Patent Application 145,954. 2 May 1980. 16p.

A liquid-tight enclosure is partially filled with water. A container supports a porous bed of sand and gravel that is partially submerged in the liquid. The lower end of the porous bed is spaced upward from the bottom of the enclosure. A gas delivery duct feeds gas to a location vertically beneath the porous bed to enable a stream of gas to pass upwardly through the porous bed, drawing water with it to continuously clean the gravel.

2203 Fuel Elements

15680 **(NUREG/CR—1339) Independent assessment of the steady state fuel rod analysis code FRAPCON-1.** Laats, E.T.; Peeler, G.B.; Scofield, N.R. (EG and G, Inc., Albuquerque, NM (USA)). Jun 1980. 120p. (EGG—2020). NTIS, PC A06/MF A01.

The predictive capabilities of the steady state fuel rod behavior program, FRAPCON-1, have been independently assessed. FRAPCON-1 code predictions of fuel behavior are compared with experimental data for test rods and with predictions from the FRAP-S3 code for commercial design rods. The code-to-data comparisons are used to assess the accuracy of fuel rod thermal, pressure, deformation, and corrosion models under steady state operating conditions. The code-to-code comparisons are used to identify the effects of model differences between FRAPCON-1 and the previously assessed fuel behavior code, FRAP-S3. On the basis of results of these studies, conclusions are given regarding present model capabilities and future development needs.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 15700

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 15664, 15944

15681 **(HEDL-SA—2214) Experience in startup and operation of fast flux facility.** Moffitt, W.C. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 3p. (CONF-8009102—2). NTIS, PC A02/MF A01.

From Joint power conference; Phoenix, AZ, USA (28 Sep 1980).

The testing program was structured to perform all testing under formal testing procedures with a test engineer as the test director and the plant operators operating the systems and equipment. This provided excellent training and experience for the operators in preparation for eventual reactor operation. Operations preparations for the testing and operation activities has consisted of academic training, formal on-the-job training including systems operation and examinations by persons with an expert knowledge on that portion of the plant, training at EBR-II and the High Temperature Sodium Facility for selected senior operators, operating procedure preparation, training on an FFTF Control Room operator training simulator, and formal written, oral and operating examinations.

15682 **(JAPFNR—565) Power coefficient anomaly in Joyo.** Yamamoto, H. (Power Reactor and Nuclear Fuel Development Corp., Oarai (Japan)). Dec 1980. 47p. NTIS, PC A03/MF A01.

Work performed under United States - Japanese Fast Reactor Exchange Program.

Operation of the JOYO experimental fast reactor with the MK-I core has been divided into two phases: (1) 50 MWt power ascension and operation; and (2) 75 MWt power ascension and operation. The 50 MWt power-up tests were conducted in August 1978. In these tests, the measured reactivity loss due to power increases from 15 MWt to 50 MWt was 0.28% Δ K/K, and agreed well with the predicted value of 0.27% Δ K/K. The 75 MWt power ascension tests were conducted in July-August 1979. In the process of the first power increase above 50 MWt to 65 MWt conducted on July 11, 1979, an anomalously large negative power coefficient was observed. The value was about twice the power coefficient values measured in the tests below 50 MW. In order to reproduce the anomaly, the reactor power was decreased and again increased up to the maximum power of 65 MWt. However, the large negative power coefficient was not observed at this time. In the succeeding power increase from 65 MWt to 75 MWt, a similar anomalous power coefficient was again observed. This anomaly disappeared in the subsequent power ascensions to 75 MWt, and the magnitude of the power coefficient gradually decreased with power cycles above the 50 MWt level.

15683 **FFTF fuel systems design criteria.** Dutt, D.S.; Baars, R.E.; Jackson, R.J.; Weber, J.W. (Westinghouse Hanford, Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 262-263(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15684 **History, facilities, and programs of the Los Alamos Critical Assemblies Laboratory.** Malenfant, R.E. (Los Alamos Scientific Lab., NM). *Transactions of the American Nuclear Society ;* **34**: 323-324(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15685 **Sham ram-scram: a positive reactivity change on disassembly.** Martin, E.R.; Jarvis, G.A.; Malenfant, R.E.; Plassmann, E.A. (Los Alamos Scientific Lab., NM). *Transactions of the American Nuclear Society ;* **34**: 324-325(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

2209 Reactor Safety

REFER ALSO TO CITATION(S) 16178

15686 **(AD-A—084553) Structural integrity of water reactor pressure boundary components. Quarterly progress report Oct-Dec 79.** Loss, F.J. (Naval Research Lab., Washington, DC (USA)). 20 Mar 1980. 70p. NTIS, PC A04/MF A01.

This report describes progress in a continuing program to characterize material properties performance with respect to structural integrity of light water reactor pressure boundary compo-

nents. Progress under fracture mechanics investigations includes the first J-R curve trends from A533-B weld deposit irradiated under the HSST program. A new experimental procedure was developed for the testing of 0.5T-CT specimens by the single specimen compliance technique. Fatigue crack growth rates are being determined for a variety of pressure vessel and piping steels in simulated nuclear coolant environments. New results of cyclic crack growth on several pressure vessel steels are presented along with the results of the first test of irradiated A533-B steel, tested in the high-temperature pressurized water environment. Work in radiation sensitivity and postirradiation properties recovery has embarked on phase 2 of the irradiation-anneal-reirradiation (IAR) program. Investigations were continued on the postirradiation notch sensitivity of reactor vessel steels in a coordinated IAEA program.

15687 **(ALO—135) Selection methodology for LWR safety R and D programs and proposals. Volume III. User's manual for the multi-attribute utility package (MAUP).** Hale, M.; Turnage, J.J.; Husseiny, A.A.; Ritzman, R.L. (Science Applications, Inc., Ames, IA (USA)). Feb 1981. Contract AC04-76DP00789. 81p. (SAI—101-81-AM). NTIS, PC A05/MF A01.

The computer program which was developed to apply the multi-attribute utility (MAU) methodology to the selection of LWR safety R and D programs and proposals is described. An overview of the MAU method is presented, followed by a description of the steps incorporated in developing individual modules for use in the multi-attribute utility package (MAUP). Each module is described complete with usage information and an example of computer output.

15688 **(ALO—136) Risk aversion in risk acceptance criteria.** Wu-Chien, J.S.; Apostolakis, G. (California Univ., Los Angeles (USA). School of Engineering and Applied Science). Mar 1981. Contract AS04-78ET35400. 19p. NTIS, PC A02/MF A01.

The risk averse attitude that is included in some proposed risk acceptance criteria is examined. It is shown that it is a weaker attitude than risk aversion, as is commonly defined in decision theory. Consequently, the boundary curve separating acceptable and unacceptable regions does not have to be a straight line on the logarithmic frequency-consequence space. A curve of variable slope would express the same attitude as long as the slope is less than -1.

15689 **(CONF-791118—12) PBF experimental program.** MacDonald, P.E.; Zeile, H.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1979. Contract AC07-76ID01570. 35p. NTIS, PC A03/MF A01.

From 7. water reactor safety research information meeting; Gaithersburg, MD, USA (5 Nov 1979).

The fuels behavior research in PBF is directed towards providing a detailed understanding of the response of nuclear fuel assemblies to off-normal and hypothetical accident conditions. Single fuel rods and clusters of highly instrumented fuel rods are installed within a central test space of the PBF core for testing. The core can be operated in various modes to provide test conditions typical of accidents and off-normal conditions such as: (1) Power-Cooling-Mismatch (PCM) accidents; (2) Loss-of-Coolant Accident (LOCA); (3) Reactivity-Initiated-Accident (RIA); (4) Operational Transients With and Without Scram (OPTRAN); (5) Small Break LOCAs (SBL). This document provides an overview of each of the PBF test series with emphasis on what has been learned to date and why the remaining tests are being conducted. (DLC)

15690 **(LA-UR—80-2993) Development of the reactor safety film.** Sheheen, N.N.; Hodson, P.J. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 8p. (CONF-810501—1). NTIS, PC A02/MF A01.

From National computer conference; Chicago, IL, USA (May 1981).

The first computer-generated film of LASL's Reactor Safety efforts was developed using the ANIMATE framework, a program that adds visual capabilities to MAPPER. Numerous software limitations had to be overcome within a very limited production schedule. A significant achievement was the 15,000-vector-per-frame sequence depicting a pressurized water reactor core with parts flashing while pumps circulate fluid through the system.

15691 **(NUREG/CR—1239) MASFLO: a computer code to calculate mass flow rates in the Thermal-Hydraulic Test Facility (THTF). Technical report.** White, M.D. (Oak Ridge National Lab., TN (USA)). May 1980. 34p. (ORNL/NUREG/TM—268). NTIS, PC A03/MF A01.

This report documents a modular data interpretation computer code. The MASFLO code is a Fortran code used in the Oak Ridge National Laboratory Blowdown Heat Transfer Program to convert measured quantities of density, volumetric flow, and momentum flux into a calculated quantity: mass flow rate. The code performs both homogeneous and two-velocity calculations. The homogeneous models incorporate various combinations of the Thermal-Hydraulic Test Facility instrumented spool piece turbine flow meter, gamma densitometer, and drag disk readings. The two-velocity calculations also incorporate these instruments, but in models developed by Aya, Rouhani, and Popper. Each subroutine is described briefly, and input instructions are provided in the appendix along with a sample of the code output.

15692 **(NUREG/CR—1287) Independent verification testing: analyses of alternatives for conducting independent verification testing of environmentally qualified safety-related equipment. Technical report.** Bonzon, L.L.; Rutherford, W.R. (Sandia Labs., Albuquerque, NM (USA)). May 1980. 405p. (SAND—78-2411). NTIS, PC A18/MF A01.

This study provides an analysis of alternatives for conducting independent verification testing of environmentally qualified safety-related equipment which is required to operate in nuclear plant safety systems. Three major alternatives were costed and compared: (1) NRC dedicated test facility; (2) NRC contracts for testing to existing test laboratories; (3) NRC review and witnessing of vendor tests. To formalize the evaluation, eleven specific criteria were identified against which the alternatives were compared. None of the alternatives singly show clear advantage; but in the dual combinations, an 'optimal' alternative emerges when alternatives 1 and 3 are considered in union. This study also illustrates the magnitude and immediacy of the equipment environmental qualification issue. It recommends that dedicated NRC staff be assigned to qualification programs review and that other NRC staff continue this study to define, coordinate, and implement an optimal alternative.

15693 **(NUREG/CR—1292) Two-phase jet loads. Fiscal year 1979 annual report.** Tomasko, D. (Sandia Labs., Albuquerque, NM (USA)). May 1980. 112p. (SAND—80-0267). NTIS, PC A06/MF A01.

The consequences of a pipe break must be considered in detail in the design of a nuclear power plant system. Pipe restraints must be installed to prevent large displacements resulting from thrust forces, and jet deflectors must be engineered to preclude additional effluent damage on the system. Over-design of the system must be avoided due to safety and economic considerations. The two-phase jet load program at Sandia National Laboratories is endeavoring to develop an improved approximate engineering model to characterize two-phase jets emanating from breaks in a typical PWR piping system in order to more realistically predict loads and flows. This annual report discusses the work completed on two-phase jets in FY79. Topics include two-phase jet experimental data, computer code evaluation for two-phase jet analyses, and current and future two-phase jet load work.

15694 **(NUREG/CR—1343) Qualification testing evaluation program light-water reactor safety research. Quarterly report apr-jun 79.** Bonzon, L.L.; Clough, R.L.; Gillen, K.T.; Salazar, E.A. (Sandia Labs., Albuquerque, NM (USA)). May 1980. 39p. (SAND—80-0276). NTIS, PC A03/MF A01.

This report presents progress and research in the Qualification Testing Program (QTE) for the April-June 1979 quarter. Under Task 1, the principal effort was devoted to the initiation of verification tests of the qualification of Browns Ferry Unit 3 connector assemblies. Radiation and thermal-aging experiments were completed, and a superheat test capability demonstrated in prepara-

tion for the accident simulation test phase. Under Task 3, significant effort was directed toward analyses of experiments that indicated a strong synergism for polymer degradation in a radiation-thermal environment. The balance of the quarterly effort centered on ongoing projects. Within the methodologies task, the test-facility upgrade and preparation for the connector tests received primary emphasis. Within the radiation-source task, effort continued on the development of a 'best-estimate' LOCA-radiation signature and the drafting of a 'simulator-adequacy' assessment report. Within the accelerated-aging task, the primary emphasis was on fire-retardant aging tests, continued combined-environments testing of electrical cable materials, and the evaluation of ambient-aged electrical cable samples.

15695 **(NUREG/CR—1400) Quarterly technical progress report on water reactor safety programs sponsored by the Nuclear Regulatory Commission's Division of Reactor Safety Research, January-March 1980.** Ybarnondo, L.J. (EG and G, Inc., Albuquerque, NM (USA)). May 1980. 40p. (EGG—2031). NTIS, PC A03/MF A01.

Water reactor research performed by EG and G Idaho, Inc. during January through March 1980 is reported. The Semiscale Program conducted four small break loss-of-coolant tests to aid in evaluation of Semiscale system heat losses and provide data to the NRC for evaluation of small break analytical model capability to properly predict the effects of primary coolant pump operation during a small break loss-of-coolant accident. The Loss-of-Fluid Test Experimental Program conducted the second nuclear experiment in its Small Break Test Series L3. The Thermal Fuels Behavior Program completed a power-cooling-mismatch/reactivity initiated accident test in the Power Burst Facility reactor, a fission gas release test in the Halden Reactor in Norway, and the second in a series of internal fuel rod fill gas composition tests. The Code Development and Analysis Program progressed in the development of advanced computer codes (FRAPCON-2 and FRAP-T6) for predicting the steady state and transient behavior of light water reactor fuel rods. The Code Assessment and Applications Program characterized a data sample for fuel code assessment and initiated PWR and BWR analysis to identify and analyze accident sequences. Engineering Support Projects progressed in development of flow measurement instrumentation in the 3-D Experiment Project and in advanced instrumentation development, with the application of a heated differential thermocouple liquid level system.

15696 **(NUREG/CR—1430) Test PCM-5 fuel rod materials behavior.** Kerwin, D.K. (EG and G, Inc., Albuquerque, NM (USA)). May 1980. 136p. (EGG—2033). NTIS PC E04/MF A01.

Test PCM-5 was the first nine-rod bundle test in the Power-Cooling-Mismatch (PCM) Test Series. The test objectives were to evaluate the behavior of the center rod operated in an environment typical of a commercial reactor rod subjected to a PCM transient, and to investigate the potential for rod-to-rod interactions. The center rod experienced about 215s of high temperature (about 1500K) film boiling and did not fail. Six surrounding rods operated in stable film boiling for varying times, and two rods failed during operation. Test PCM-5 fuel rod materials behavior, analyzed from post-irradiation examination results, is presented in this report. Post-test bundle and individual fuel rod appearances are discussed. Fuel rod axial, circumferential, and radial temperature profiles are presented. Rod bowing during operation is discussed, and bow direction reversal on quench is explained from structural analyses. Cladding and fuel microstructural and chemical changes are presented. Fuel rod failures and failure mechanisms are discussed.

15697 (ORNL—5725, pp 8.1-8.12) **Systems reliability and operations research.** Dec 1980.

In Engineering Physics Division progress report for period ending November 30, 1980.

Systems reliability and operational research is a new area of development within the Engineering Physics Division. It consists of research in risk assessment, risk analysis, common cause methodology, systems analysis, operations research and the data analysis needed to support these efforts. Two previously existing data analysis efforts, SACRD and CREDO, are included. Since 1979, the Division has been involved in risk-related programs for the Nuclear Regulatory Commission, especially programs involving acceptable risk and common cause methodology (i.e., fires and floods). Finally, the division has initiated several areas of research dealing with operations research. These areas specifically support NRC research needs in the area of human factors. Over all these systems, reliability and operations oriented programs are expected to expand into a major area of work within the Division. It is expected that most of the effort will be suggested either by the Nuclear Regulatory Commission or by the Department of Energy for LMFBR-related research.

15698 (ORNL—5725, pp 9.1-9.14) **Information analysis and distribution.** Dec 1980.

In Engineering Physics Division progress report for period ending November 30, 1980.

Since it was established in 1962, the Division's Radiation Shielding Information Center (RSIC) has become a model of technology transfer, especially as a result of its technical activities associated with computer code and data exchange. In addition to RSIC, the Division now has two other information analysis and data centers: the Reactor Safety Research Data Repository (RSRDR) and a Technical Data Management Center (TDMC), both established under sponsorship of the Nuclear Regulatory Commission to validate and standardize computing technology and to organize, manage, and disseminate selected data bases for use in NRC licensing and regulatory processes. Management of the work of RSIC, RSDR, and TDMC falls under the umbrella of the Engineering Physics Information Centers (EPIC). Management of the Biomedical Computing Technology Information Center (BTIC), a center initiated in the Division in 1975 and developed into a successful prototype, was transferred in FY 1980 into a medical research environment at Vanderbilt University.

15699 **(SRD-R—181) Mean spherical model as a model for UO_2.** Martin, D.; MacInnes, D.A. (UKAEA Risley Nuclear Power Development Establishment, Culcheth. Safety and Reliability Directorate). Dec 1980. 15p. NTIS, PC A02/MF A01.

Work performed under United States--UKAEA Fast Reactor Exchange Program.

This report gives a brief description of the Mean Spherical Model. Then calculations using the model are compared with experimental results for molten salts. Finally calculations for molten UO_2 are presented.

15700 **Emergency preparedness for what. Implications of the TMI-2 accident.** Hull, A.P. (Brookhaven National Lab., Upton, NY). *Nuclear News (La Grange Park, Illinois) ;* **24**: No. 5, 61-67(Apr 1981).

From American Nuclear Society's executive conference on state/federal/nuclear industry interface; Monterey, CA, USA (4 Feb 1981).

Radioactive effluents associated with the Three Mile Island-2 reactor accident are analyzed. Emergency procedures related to the protection of surrounding populations are analyzed with regards to feasibility and effectiveness. 36 references.

15701 **Recommended research for improving seismic safety of light-water nuclear power plants.** Reed, J.W.; Waugh, C.B. (Engineering Decision Analysis Co., Inc., Palo Alto, CA (USA)); Riesemann, W.A. von (Sandia National Labs., Albuquerque, NM (USA)); Kennedy, R.P. (Engineering Decision Analysis Co., Inc., Irvine, CA (USA)). *Nuclear Engineering and Design ;* **59**: No. 1, 57-66(Jul 1980).

From 5. international conference on structural mechanics in reactor technology (SMIRT-5). 9. international seminar and 2. international seminar on structural reliability of mechanical components and subassemblies of nuclear power plants and 2. international seminar on containment of fast breeder reactors (CONFABRE-2); Berlin, Germany, F.R. (9 - 21 Aug 1979).

Recommendations for research to improve the seismic safety of Light Water Reactors (LWR) are presented in this paper, based on analysis of the answers to a questionnaire returned by 55 persons or groups working the area of seismic safety of nuclear power plants. In addition to the questionnaire results, the recommendations also include ideas expressed at a meeting of an ad hoc group of professionals, formed by Sandia Laboratories; a review of literature, current research programs, and engineering judgment.

15702 **Theoretical foundation for the modeling of two-phase flow.** Ishii, M. (Argonne National Lab., IL). *Transactions of the American Nuclear Society ;* **34**: 273-274(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15703 **Two-phase flow calculations in low-pressure systems.** Dunn, F.E. (Argonne National Lab., IL). *Transactions of the American Nuclear Society ;* **34**: 277-278(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15704 **Implicit noniterative method for computing liquid and gas flow.** Hofmann, J.R. (Argonne National Lab., IL). *Transactions of the American Nuclear Society ;* **34**: 309-311(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15705 **Triangular geometry fluid dynamics with reduced artificial diffusion.** Steinke, R.G. (Los Alamos Scientific Lab., NM). *Transactions of the American Nuclear Society ;* **34**: 311-312(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15706 **Application of sensitivity theory for extrema of functionals to a transient reactor thermal-hydraulics problem.** Cacuci, D.G. (Oak Ridge National Lab., TN); Weber, C.F. *Transactions of the American Nuclear Society ;* **34**: 312-314(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15707 **Applications of differential sensitivity theory for problems with discontinuities.** Weber, C.F. (Union Carbide Corporation Nuclear Div., Oak Ridge, TN); Cacuci, D.G.; Parks, C.V. *Transactions of the American Nuclear Society ;* **34**: 314-315(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15708 **Computer program SWAAM-I for analysis of large sodium-water reactions in LMFBR secondary systems.** Shin, Y.W. (Argonne National Lab., IL). *Transactions of the American Nuclear Society ;* **34**: 317-319(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15709 **^{131}I release probability distribution for a fuel handling accident.** Buslik, A.J.; Krieger, T.J. (Brookhaven National Lab., Upton, NY). *Transactions of the American Nuclear Society ;* **34**: 441-442(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

25 ENERGY STORAGE

REFER ALSO TO CITATION(S) 15432

2505 Flywheels

15710 **(Y/DX—244) Rockwell-Rocketdyne flywheel test results.** Steele, R.S. Jr.; Babelay, E.F. Jr.; Sutton, B.J. (Oak Ridge Y-12 Plant, TN (USA)). Jan 1981. Contract W-7405-ENG-26. 51p. NTIS, PC A04/MF A01.

Results are presented of the spin test evaluation of the Rockwell-Rocketdyne RPE-10 design flywheel at the Oak Ridge Flywheel Evaluation Laboratory. Details of the static evaluation, including measures of weight, inertia, natural frequencies, and radiography, are also presented. The flywheel was subjected to seven spin cycles with a maximum of 383 rps, 105% of design speed. At that speed, the energy stored was 1.94 kWhr at 36.1 Whr/kg. The maximum speed was limited by the inability of the test facility to accommodate the increasing eccentric shift of both hub disks with increasing speed. No material degradation was observed during the testing.

2506 Thermal

REFER ALSO TO CITATION(S) 15554, 15555, 15731, 15773

15711 (CONF-801128—, pp 17-26) **Concept design of aquifer thermal energy storage system.** (Univ. of Minnesota, St. Paul). 1980.

From Mechanical, magnetic, underground energy storage contractors review; Washington, DC, USA (10 Nov 1980).

In May, 1980 a field test began, consisting of construction of a well doublet and monitor wells for storing 150°C hot water in a regional aquifer under the St. Paul Campus of the University of Minnesota. The purpose of this test is to define the characteristics of an aquifer with hot water and to define the environmental, institutional, economic and technical feasibility of a full scale demonstration incorporating a heat source for the aquifer, a transport system for hot water, an end-use system for the stored energy, and an integration of above ground heat exchanger equipment between the transport system, the end-use system and the aquifer. The results of the tests will be used to provide a concept design and proposal for construction of a full scale thermal energy storage system for Phase II of this demonstration.

15712 **Seas--a system for undersea storage of thermal energy.** Powell, J.D.; Powell, J.R. (Scripps Inst of Oceanogr, La Jolla, Calif). pp 527-532 of Ocean conference. Piscataway, NJ; IEEE (1979).

From MTS Oceans conference; San Diego, CA, USA (Sep 1979).

Methods of storing medium grade (200 to 275°C) thermal energy are of great economic interest for electric generation and process heat. Storage of water heated by land based energy sources and pumped to ocean or lake depths great enough that the ambient hydrostatic pressure equals the saturation pressure appears to be a low cost, safe, and technically feasible method for storing large volumes of hot water. 4 refs.

2509 Batteries

REFER ALSO TO CITATION(S) 15806

15713 **(SAND—80-2341) Experimental investigations of certain side reactions and the initial voltage transient for FeS_2 cathodes in thermal batteries.** Searcy, J.Q.; Delnick, F.M.; D'Angelo, J.C. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 16p. NTIS, PC A02/MF A01.

The direct reaction of FeS_2 with stainless steel current collectors reduces the coulombic efficiency of thermal cell cathodes. When single cells are discharged in air, the reduction of O_2 at the FeS_2 cathode represents a significant fraction of the discharge current. At least five separate phenomena contribute to the initial voltage transient observed in thermal batteries which use FeS_2 for the cathode material. These five phenomena are: (1) a thermodynamic increase in the potential caused by the initial temperature peak which results from the heat pellets when ignited, (2) electrochemical participation of surface contaminants on the FeS_2, (3) electrochemical reduction of oxygen or reaction products of oxygen with FeS_2, (4) electrochemical reduction of elemental sulfur produced by the thermal decomposition of FeS_2, and (5) the voltage decrease which accompanies the saturation of the electrolyte with the electrochemical reduction product, or products. Mitigative techniques for the observed phenomena include: (1) performing single cell tests under an inert atmosphere, (2) using a nonreactive material for current collectors, (3) using an additive with the cathode to suppress the initial voltage transient, and (4) predischarging the cathodes.

15714 **Wetting properties of the sulfur electrolyte in sodium-sulfur batteries.** Janz, G.J.; Murphy, R.M.; Spiak, W.A. (Rensselaer Polytechnic Inst., Troy, NY). *Journal of Applied Electrochemistry ;* **10**: No. 6, 789-797(Nov 1980).

In the sulfur electrode of sodium-sulfur cells, carbon surfaces (generally as yarns or felts) are used as current collectors. During the charging cycle, oxidation of the molten polysulfides results in sulfur as a second (immiscible) phase. If sulfur has preferential wetting properties, an insulating sulfur layer may be established. A technique for wetting measurements with the molten sulfur electrolyte at ~ 330°C is described. The wetting properties of molten sulfur and molten polysulfides were investigated with both untreated and metal oxide-treated carbon surfaces as substrates. Results are reported for felts with Fe, Ni, Co, Cr, Al (as oxides), and with H_2O, NaOH, Na_2SO_4, and $Na_2S_2O_3$ as impurities in the fluid electrolyte. 6 figures, 6 tables.

15715 **Electrochemical cell method.** Kaun, T.D.; Eshman, P.F. (to Dept. of Energy). US Patent Application 148,325. 9 May 1980. 19p.

A secondary electrochemical cell is prepared by providing positive and negative electrodes having outer enclosures of rigid perforated electrically conductive material defining an internal compartment containing the electrode material in porous solid form. The electrodes are each immersed in molten electrolyte salt prior to cell assembly to incorporate the cell electrolyte. Following solidification of the electrolyte substantially throughout the porous volume of the electrode material, the electrodes are arranged in an alternating positive-negative array with interelectrode separators of porous frangible electrically insulative material. The completed array is assembled into the cell housing and sealed such that on heating the solidified electrolyte flows into the interelectrode separator.

15716 **Electrode for electrochemical cell.** Kaun, T.D.; Nelson, P.A.; Miller, W.E. (to Dept. of Energy). US Patent Application 148,312. 9 May 1980. 20p.

An electrode structure for a secondary electrochemical cell includes an outer enclosure defining a compartment containing electrochemical active material. The enclosure includes a rigid electrically conductive metal sheet with perforated openings over major side surfaces. The enclosure can be assembled as first and second trays each with a rigid sheet of perforated electrically conductive metal at major side surfaces and normally extending flanges at parametric margins. The trays can be pressed together with moldable active material between the two to form an expandable electrode. A plurality of positive and negative electrodes thus formed are arranged in an alternating array with porous frangible interelectrode separators within the housing of the secondary electrochemical cell.

29 ENERGY PLANNING AND POLICY

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 15730, 15736, 15738, 15739, 15740, 15783, 15786

15717 **(BNL—28727) Overview of the principal Brookhaven energy system optimization models.** Kydes, A.S. (Brookhaven National Lab., Upton, NY (USA). National Center for Analysis of Energy Systems). Nov 1980. Contract AC02-76CH00016. 40p. (CONF-801137—4). NTIS, PC A03/MF A01.

From Workshop on energy policy analysis; Urbino, Italy (3 Nov 1980).

The Brookhaven Energy System Optimization Model (BESOM), three of its variants, and two examples of characteristic applications are described. BESOM is a linear-programming model that was developed for the quantitative evaluation of energy technologies and policies within a systems framework. The model is designed to examine interfuel substitutions in the context of constraints on the availability of competing resources and technologies. BESOM provides a snapshot of the national energy system configuration, while MARKAL and TESOM provide, respectively, a farsighted time dimension and a simulation capability for the examination of the evolution of a national energy system over a time horizon.

15718 **Research strategies for evaluating the adoption potential of energy technologies.** Berry, L.; Bronfman, L.M. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Policy Studies Journal ;* **9**: No. 5, 721-734(Spr 1981).

The completely novel nature of some energy technology innovations sometimes makes prospective economic analysis of adoption potential neither desirable nor feasible. Three noneconomic models evaluating adoption potential are examined for technological innovations whose diffusion potential is not yet known. Applications of the general models are suggested with specific references to development of solar total energy systems.

15719 **(ORNL/TM—7739) Leap Model 22C results versus EIA 1979 report.** Goldstein, M. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG26. 28p. NTIS, PC A03/MF A01.

A comparison study of LEAP Model 22C predicted results for years 1975 and 1980 versus the compiled real data of EIA 1979 report for years 1975, 1976, 1977, 1978, and 1979 has been performed. It is concluded that most of the quantities predicted by LEAP Model 22C for 1975 and 1980 are in reasonable agreement (within about 2%) with EIA 1979 as well as with EIA 1978 data. Many differences between LEAP Model 22C predicted results and EIA 1979 real data for years 1975 and 1980 are also discussed.

15720 **Energy policy modeling: United States and Canadian experiences. Volume II. Integrative energy policy models.** Ziemba, W.T.; Schwartz, S.L. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980). 398p.

The Canadian Energy Policy Modeling Conference, held in North Vancouver, May 18-20, 1978, was organized to assess the state of the art in energy modeling in North America. A major aim of the conference was to determine the extent to which energy modeling had and could make a contribution to the energy-policy decision-making process. Two volumes contain revised and updated versions of the major papers presented at the conference plus edited transcripts of the panel discussions and several additional papers aimed at particular topics deemed worthy of further study. For this volume, Vol. II, a separate abstract was prepared for each of 17 papers, 2 panel discussions, and three session-introduction commentaries for Energy Abstracts for Policy Analysis (EAPA); 7 abstracts will appear in Energy Research Abstracts (ERA).

15721 **Brookhaven Energy System Optimization Model: its variants and uses.** Kydes, A.S. (Brookhaven National Lab., Upton, New York). Contract EY-76-C-02-0016. pp 110-136 of Energy policy modeling: United States and Canadian experiences. Volume II. Integrative energy policy models. Ziemba, W.T.; Schwartz, S.L. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

A general overview of the Brookhaven Energy System Optimization Model (BESOM) is presented as well as two of its variants (MARKAL and TESOM) and two examples of characteristic applications. BESOM is a linear programming model developed for the quantititative evaluation of energy technologies and policies within a systems framework. The model is designed to examine interfuel substitutions in the context of constraints on the availability of competing resources and technologies. BESOM provides a snapshot of the national energy-system configuration, while MARKAL and TESOM provide, respectively, a farsighted time dimension and simulation capability for the examination of the evolution of a national energy system over a time horizon. 26 references, 7 figures, 6 tables.

15722 **Integrated forecasting model: a progress report.** Balson, W.E. (Decision Focus, Inc., Palo Alto, CA); Peck, S.C. pp 137-154 of Energy policy modeling: United States and Canadian experiences. Volume II. Integrative energy policy models. Ziemba, W.T.; Schwartz, S.L. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

A model of the US energy sector has been developed by the Systems Program of the Energy Analysis and Environment Divi-

sion (EAE) of the Electric Power Research Institute (EPRI) using submodels provided by EAE's Demand and Conservation Program and Supply Program. A network diagram of the energy sector is used to define the frequently complex links between the submodels. A preliminary base case for 1975 to 2000 has been run, and the model is currently being calibrated to actual data for 1975 and is being compared with runs of other energy models. The model will ultimately provide information to the EPRI planning staff for use in constructing a research and development overview. 9 references, 11 figures.

15723 **Energy policy modeling: United States and Canadian experiences. Volume I. Specialized energy policy models.** Ziemba, W.T.; Schwartz, S.L.; Koenigsberg, E. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980). 415p.

The Canadian Energy Policy Modeling Conference held in North Vancouver, May 18-20, 1978, was organized to assess the state of the art in energy modeling in North America. A major aim of the conference was to determine the extent to which energy modeling had and could make a contribution to the energy-policy decision-making process. Two volumes contain revised and updated versions of the major papers presented at the conference plus edited transcripts of the panel discussions and several additional papers aimed at particular topics deemed worthy of further study. This volume, Vol. I, is concerned with specialized models and contains the following sections: (a) Energy Demand Modeling (7 papers); (b) Energy Supply Modeling (5 papers); (c) Coal and Transportation Modeling (6 papers); and (d) Problems and Interactions of Energy, Environment, and Conservation (4 papers). A separate abstract was prepared for each of the 22 papers for Energy Abstracts for Policy Analysis (EAPA); 5 abstracts will appear in Energy Research Abstracts (ERA).

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 15737, 15745, 15746, 15747

15724 **(DOE/EI/11973—T1) Bibliography of studies dealing with incentives and their impacts on energy development. Fianl report.** (Fiorello, Shaw and Associates, Vienna, VA (USA); Mathtech, Inc., Arlington, VA (USA)). 9 Mar 1981. Contract AC01-80EI11973. 460p. NTIS, PC A20/MF A01.

A bibliography, in two parts, is presented on the incentives and their impacts on energy development. The first part from the DOE Energy Data Base contains the number of citations indicated in the follwing areas: financial or legal incentives and the coal industry (138); the oil industry (120); the natural gas industry (139); the oil shale industry (11); the nuclear fuel industry (8); hydrogen fuel (3); other fuels (37); the solar industry (425); geothermal energy (68); wind energy (8); and nuclear power (13). The publication description, data, abstract, and descriptors are given for the citations. The second part of the bibliography was drawn from the National Science Foundation's records.

15725 **Employment impacts of achieving automobile-efficiency standards in the United States.** Dacy, D.C.; Kuenne, R.E.; McCoy, P. *Applied Economics ;* **12**: No. 3, 295-312(Sep 1980).

Employment impacts for 1980 and 1985 are calculated in the two extreme policy cases: (1) optimistic technological case-upper bound m.p.g. estimate and (2) pessimistic technological case-lower bound m.p.g. estimate. These cases, respectively provide the most optimistic and the most pessimistic forecasts. Given the assumptions underlying the most-optimistic case, 80% of the gain in m.p.g. will come from technological advance (and 20% from weight reduction), compared to only 40% (and 60%) under the most-pessimistic case. The net effect on employment in 1985 is not sensitive to assumptions about technological change; however, the impacts on some sectors are. The major inter-industry employment impacts are in iron and steel and petroleum and gas (production). In the former, employment is calculated to fall by nearly 4% in 1985 under the most-pessimistic assumptions but less than 1% under the most-optimistic. In petroleum and gas (production), the change in 1985 is about 10% of total employment. The decline in wholesale and retail trade amounts to 0.7% (some of which is probably due to employment losses in retail-gasoline outlets) but it is more than offset by small gains in other sectors. Two plastics sectors combined gain about 4% in employment under the most-pessimistic assumptions. The general conclusion of our study is that if macroeconomic policy manages to keep the US economy growing at the average of past rates, automobile m.p.g. standards policy will have a slight positive impact on employment after taking into account minor shifts among sectors. 11 references, 16 figures.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 15245, 16057, 16058, 16119, 16125, 16126

2904 Natural Resources

15726 **Water law, water transfers, and economic efficiency: the Colorado River.** Burness, H.S. (Univ. of New Mexico, Albuquerque); Quirk, J.P. Contract EY-76-G-03-1305. *Journal of Law and Economics ;* **13**: No. 1, 111-134(Apr 1980).

The Colorado River illustrates that inefficient water allocation in the form of restricted transfer rights can give a false impression of water shortages. Transfer obstructions at the Federal, interstate, and intrastate levels include the prior-appropriation doctrine and return-flow externalities. Water allocation can be made more efficient by introducing competitive markets and reducing the amount allotted to agriculture. This would provide incentives to improve irrigation practices and free up as much as 10% of Colorado River water for other uses. 32 references. (DCK)

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 15249, 15718, 15737, 15750, 15805

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 15397, 15641, 15642, 15643, 16293

15727 **(EMD—80-89) Three Mile Island: the financial fallout.** (General Accounting Office, Washington, DC (USA)). 7 Jul 1980. 96p. GPO.

Report to the Congress of the United States by the Comptroller General.

The nuclear accident at Three Mile Island raised serious questions about the financial ability of the electric utility company owners to clean up and repair the damaged reactor facilities while continuing to provide reliable electric service to customers. Financial insolvency of the companies is not imminent and power supplies are assured for the immediate future. However, the loss of earnings capability by the Metropolitan Edison Company makes it questionable whether it can fund its share of the clean-up costs and maintain system reliability without large rate increases or some external financial assistance. The accident has shown that the utilities and Federal and State regulatory agencies were not prepared to deal with recovery from such a large financial loss. The Department of Energy should move swiftly to assess the financial needs of the affected utilities and develop plans for meeting them.

15728 **Deferral of nuclear-fuel reprocessing and plutonium breeder commercialization.** Perry, W.D. (Florida A and M Univ., Tallahasse). Contract EX-76-C-01-2337. *Resources and Energy ;* **2**: No. 4, 341-372(Dec 1979).

From ORSA/TIMS Joint National meeting; Los Angeles, CA, USA (Nov 1978).

Nuclear-weapons proliferation and environmental and economic concerns have resulted in the US deferral of commercial-scale reprocessing of nuclear fuel and the development of plutonium breeding reactors. It has been argued that deferral of reprocessing might further delay a US decision to proceed with breeder commercialization. Following a background of the relationships between nuclear-fuel reprocessing and recycling for existing power

reactors and the proposed plutonium breeders and a brief assessment of recent economic studies of reprocessing for recycle, this paper analyzes the time and capacity of commercial-scale reprocessing facilities and the associated minimum Present Discounted Costs (PDC) that would support a later decision to proceed with breeder commercialization. The PDC analysis suggests that future US plans for plutonium-breeder commercialization are not economically dependent on initiating commercial-scale reprocessing of spent nuclear fuel at the present time. 29 references, 13 figures, 5 tables.

2907 Transport And Storage

REFER ALSO TO CITATION(S) 15804, 15809

15729 **(ANL/EES-TM—123) Financial and physical capacity of the Burlington Northern Railroad to move western coal.** (Peat, Marwick, Mitchell and Co., Washington, DC (USA)). Oct 1980. Contract W-31-109-ENG-38. 57p. NTIS, PC A04/MF A01.

Studies conducted by the Department of Energy, the Department of Transportation, and the National Transportation Policy Study Commission (NTPSC) express concern about the ability of railroads both to carry projected coal traffic and to finance physical plant expansion to accommodate additional coal volumes. These studies, along with past experiences, have called into question the overall physical capacity of the Burlington Northern (BN) Railroad to meet future demands for the movement of coal out of its service areas. The conditions under which the BN could or could not meet projected levels of demand were identified. The study has relied upon secondary information provided by the BN and other sources without verifying such data. The achievement of any financial projection may be affected by possible fluctuating economic conditions and depends on the occurrence of future events which cannot be assured. Therefore, actual results achieved may vary from the projections and such variations could be material.

15730 **Evaluation of sponsored research in energy storage.** Widhelm, W.B. (Univ. of Maryland, College Park). pp 26-31 of Energy policy modeling: United States and Canadian experiences. Volume II. Integrative energy policy models. Ziemba, W.T.; Schwartz, S.L. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

Energy storage is economically attractive due to the rising costs of fossil fuels and electricity. The Federal role in developing energy-storage technologies is to support high-risk R and D in areas where private firms are unwilling or unable to invest. This study is concerned with the evaluation of this R and D, specifically methods for setting priorities and the applicability of existing national techno-economic energy models to evaluate energy-storage technology. 5 references.

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 15600, 15601, 15602, 15604, 15718, 15787, 15975

15731 **(CONF-810423—2) Overview of the US industrial thermal energy storage program.** Olszewski, M. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01.

From 1. International Energy Agency (IEA) conference on new energy conservation technologies and their commercialization; Berlin, F.R. Germany (6 Apr 1981).

In the US the industrial sector presently accounts for over 35% of the nation's total energy consumption and this fraction is expected to rise to almost 50% within the next 20 y. Thus, energy conservation efforts in this sector are important in achieving a rational US energy future. Thermal energy storage can contribute to industrial conservation efforts directed at saving premium (gas and oil) fuels, which is a priority national need. This can be done by using storage to allow the recycling of industrial reject heat to reduce primary energy consumption or to allow alternate fuels to replace gas and oil. Industrial thermal energy storage efforts include three major areas: in-plant reuse of industrial reject heat; external reuse of industrial reject heat for applications in the industrial or buildings sector; and use of alternate fuels to replace gas and oil. The program currently includes engineering field tests in the brick and aluminum industries. In addition, technology transfer activities are underway in the pulp and paper industry. These activities include all three major areas mentioned above. Efforts are being initiated in the area of advanced TES systems development and implementation. It is anticipated that this work will encompass phase change and higher temperature applications using form-stable polyethylenes, molten salt, and other advanced TES system concepts.

2910 Conservation

REFER ALSO TO CITATION(S) 15725, 15750, 15769, 15772, 15774, 15781, 15961, 15962

15732 **(P—160-81-001) Warren-Alquist State Energy Resources Conservation and Development Act, Public Resources Code Section 25000 et seq.** (California Energy Commission, Sacramento (USA)). Jan 1981. 130p. California Energy Commission, Sacramento, CA.

Incorporated are all amendments to the Act through 1980.

Chapters under Section 25000 include: Title and General Provision; Definitions; State Energy Resources Conservation and Development Commission; Planning and Forecasting; Petroleum Supply and Pricing (new); Motor Vehicle Fuel Conservation (new); Energy Resources Conservation; Energy Conservation Assistance; Petroleum Resources Management; Energy Conservation in Transportation; Energy Systems; Power Facility and Site Certification; Research and Development; Residue Conversion; Coal Gasification; Clean Coal; Energy Shortage Contingency Planning; Refined Petroleum Products Allocation (new); State Energy Resources Conservation and Development Special Account; Enforcement and Judicial Review; Insulation Standards; Gas Appliances; and Solar Shade Control. (MCW)

15733 **Assessing the performance of an energy-saving design: an earth-integrated office-living quarters facility at ORNL.** Shapira, H.B.; Barnes, P.R. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Underground Space ;* **5**: No. 3, 152-157(Nov 1980).

From Earth sheltered housing conference and exhibition-1; Minneapolis, MN, USA (11 April 1980).

An innovative earth-sheltered laboratory with passive solar features houses the Joint Institute for Heavy Ion Research (JIHIR) at the Oak Ridge National Laboratory in a facility designed for energy efficiency, acoustic isolation, and aesthetic site compatibility. The design and construction stages provided an opportunity to evaluate the benefits of both earth-sheltering and passive solar heating. The problems of glare reduction and cost and comfort tradeoffs were resolved by using reflective insulating blinds, an extendable overhang, a mass storage wall, and ambient air cooling. 4 references, 11 figures. (DCK)

15734 **Saving half of California's energy and peak power in buildings and appliances.** Rosenfeld, A.H. (Univ. of California, Berkeley); Goldstein, D.B.; Lichtenberg, A.J.; Craig, P.P. pp 374-396 of Energy policy modeling: United States and Canadian experiences. Volume I. Specialized energy policy models. Ziemba, W.T.; Schwartz, S.L.; Koenigsberg, E. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

If energy and peak electric power were valued at their replacement costs, new buildings (including homes) and appliances would consume roughly half of what they do today, and old buildings would be retrofit so as to achieve similar reductions. The authors discuss the potentials for improved use of energy in refrigerators, homes, and stoves, and peak-power shaving by storage of chilled water for air conditioning. Long-range standards as a mechanism are required to achieve these reductions. 13 references, 6 figures, 2 tables.

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 15292, 15721, 15722, 15723, 15783

15735 (DOE/EIA—0202/5) Short-term energy outlook. (USDOE Energy Information Administration, Washington, DC. Short-Term Analysis Div.). Nov 1980. 85p. GPO$4.00.

Chapter 2 of this report contains three distinctive supply-and-demand balances for the US petroleum markets through 1981. The cases differ primarily with respect to the world price of crude oil and the management of US petroleum inventories. Case 1 assumes that the nominal world price of crude oil increases at the rate of inflation in the US. This is equivalent to the assumption that real world oil prices, i.e., world oil prices adjusted to reflect the general US rate of inflation, remain constant. Case 2 assumes that there is an increase in the real world price of crude oil of $8 per barrel during the first 4 months of 1981, and that US inventories of crude oil and petroleum products are reduced from their currently high levels in the first half of 1981. Case 3 assumes a $16 per barrel increase in the real world price of crude oil the first 4 months of 1981, plus increases in real refiner and retailer margins. The methodology used takes account of the effects of world oil prices, in the alternative cases on the level of economic activity which, in turn, affects demands for the various energy products. The fully integrated forecasting system used can show the effects of economic activity, prices, and domestic energy production upon US energy supply and demand balances, including inventories. Chapter 3 covers the treatment of uncertainty in short-term projections. Chapter 4 covers projections for major energy sources and fuels (total petroleum, petroleum imports, motor gasoline, distillate fuel oil, residual fuel oil and other petroleum products, natural gas, coal, electric power, total energy, and a comparison with alternative forecasts). A glossary is included.

15736 Dynamic welfare-equilibrium framework for projecting energy futures. Parikh, S.C. (Oak Ridge National Lab., TN). pp 32-48 of Energy policy modeling: United States and Canadian experiences. Volume II. Integrative energy policy models. Ziemba, W.T.; Schwartz, S.L. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

A bird's eye description is given of a medium-scale linear-programming model for developing internally consistent projections of US energy supply, energy demand, and economic growth within an economic framework of consumer welfare maximization and competitive-market equilibrium. Also included is a summary of its applications to date, such as exploring the long term effects of rising import energy prices on the US economy and on the standard of living in general and on OPEC pricing policies in particular. An initial version of this model, called the Welfare Equilibrium Model (WEM), was developed on the PILOT Modeling Project to develop consumer energy-demand projections by modeling end-use devices. 21 references.

15737 Incorporation of new technologies in energy-supply estimation. Khazzoom, J.D. (Inst. for Research in Energy and Economic Modeling, San Francisco, CA). pp 209-227 of Energy policy modeling: United States and Canadian experiences. Volume I. Specialized energy policy models. Ziemba, W.T.; Schwartz, S.L.; Koenigsberg, E. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

A linear-programming framework is used to integrate engineering and economic approaches to estimating energy supply in the short, intermediate, and long run. It is motivated by the need to derive credible supply estimates under different price conditions, which incorporate explicitly new supply technologies in the estimation process. New technologies can be incorporated in this system as long as the technologist can specify the input requirements for investment in and operation of the new technology. Whether a technology will contribute to supply depends on its competitiveness with existing technologies, under the assumed conditions. The system developed is consistent with the 1967 input-output table for the US economy. It is specified as a disequilibrium model to allow for the fact that under certain price conditions, excess demand (or excess supply) may exist. The energy sector includes 85 vectors of energy technologies and 850 vectors of investment requirements, allowing for an investment lead time of up to ten years. The timing and extent of investment of each energy technology is determined endogenously. There are 62 energy and energy-related products. The supply results focus on oil (including synthetic), gas (including synthetic), coal, and electricity. Preliminary ex post test results are reported. 9 references.

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 15720, 15723, 15724, 15732, 15741, 15751, 16080

15738 Why should energy models form a significant policy input in an uncertain political world. Marcuse, W. (Brookhaven National Lab., Upton, NY). Contract EY-76-C-02-0016. pp 17-21 of Energy policy modeling: United States and Canadian experiences. Volume II. Integrative energy policy models. Ziemba, W.T.; Schwartz, S.L. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

Models have been and are being used by the US Department of Energy to provide inputs into the decision process. The question is often asked as to the accuracy of their forecasts and the methods used for validation. It is asserted that energy models cannot be predictive, and that validation based on experience with models of physical systems is inappropriate. Asking the question as to the accuracy or validity of an energy system model is not useful. The usefulness of energy models for policy analysis or technology assessment lies in the comparative results generated for alternative scenarios, initiatives, and actions. Embedding the model in a well-defined energy context provides a better understanding of the relationship among dependent variables, between dependent and independent variables, and among final demand variables. 5 references.

15739 Crash-mode modeling: analyzing the National Energy Plan. Greenberg, H.J. (Dept. of Energy, Washington, DC). pp 22-25 of Energy policy modeling: United States and Canadian experiences. Volume II. Integrative energy policy models. Ziemba, W.T.; Schwartz, S.L. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

With the current trend towards making modeling and analysis subject to rigorous, scientific standards, there is a need to account for the degree of urgency - i.e., the time frame in which the results can be useful. This is discussed using the analysis of the US National Energy Plan prior to its publication as the setting. The modeling identified questions that needed answering before Congressional debate and suggested improvements in the plan.

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 15245, 15249, 15250, 15251, 15275, 15289, 15290, 15290, 15292, 15295, 15295, 15296, 15296, 15299, 15303, 15319, 15319, 15735, 15774, 16080

15740 Analyzing Alaskan gas-distribution options. Greenberg, H.J. (Dept. of Energy, Washington, DC). pp 318-329 of Energy policy modeling: United States and Canadian experiences. Volume II. Integrative energy policy models. Ziemba, W.T.; Schwartz, S.L. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

The Project Independence Evaluation System (PIES) is used to analyze US options to distribute natural gas from the Alaskan North Slope. Scenario descriptions include reasons for the particular choices and how the analysis has affected the policy debates. The analysis confirms the prediction that Alaskan gas will be marketable by the mid-1980s and helps to understand the relationship of several supply and price issues. 12 references, 2 tables.

15741 Choosing the overall size of the Strategic Petroleum Reserve. Balas, E. (Carnegie-Mellon Univ., Pittsburgh, PA). pp 144-158 of Energy policy modeling: United States and Canadian experiences. Volume I. Specialized energy policy models. Ziemba, W.T.; Schwartz, S.L.; Koenigsberg, E. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

The purpose of the Strategic Petroleum Reserve (SPR) is to diminish US vulnerability to, as well as to offer protection against, possible future oil embargoes. The problem of determining the opti-

mal size of SPR is shown as a parametric bimatrix game between the United States and its potential opponent. The strategies of the opponent are embargoes of various intensities and lengths, including of course the no-embargo option. The strategies of the United States are various ways of using the reserve. The size of the reserve itself is a parameter present in both payoff functions. Solving the game for the relevant reserve sizes yields conclusions on the desirable size of the reserve, as well as on US drawdown policies in case of an embargo. The crucial element in the game-theoretic approach is that, unlike the traditional cost-benefit analysis, it fully captures the embargo-deterrent effect of an appropriate Strategic Petroleum Reserve. 7 references, 4 figures, 3 tables.

15742 **Coal-slurry pipelines: a technology assessment.** Ott, M.C. (Office of Technology Assessment, Washington, DC). pp 250-266 of Energy policy modeling: United States and Canadian experiences. Volume I. Specialized energy policy models. Ziemba, W.T.; Schwartz, S.L.; Koenigsberg, E. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

Congress requested the Office of Technology Assessment (OTA) to carry out an analysis of the potential economic, environmental, social, and legal-regulatory implications of coal-slurry-pipeline development. The major findings include: (1) under certain conditions slurry pipelines are the least-costly mode for transporting coal; (2) the current regulatory framework does not insure an optimal choice between rail and pipeline from a societal perspective; (3) the introduction of slurry pipelines is not likely to affect materially the rate of coal-resource development and use on a national scale; and (4) sufficient unused quantities of suitable water are physically present, although not necessarily legally available for the operation of several slurry pipelines from Western coal-producing regions. 1 reference, 2 figures, 1 table.

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 15420, 15469, 15470, 15786

2960 Electric Power

REFER ALSO TO CITATION(S) 15471, 15478, 15479, 15480, 15481, 15624, 15734

15743 **(DOE/RG—0053) State power plant productivity programs.** (Department of Energy, Washington, DC (USA). Economic Regulatory Administration). Feb 1981. 115p. NTIS, PC A06/MF A01.

The findings of a working group formed to review the status of efforts by utilities and utility regulators to increase the availability and reliability of generating units are presented. Representatives from nine state regulatory agencies, NRRI, and DOE, participated on the Working Group. The Federal government has been working cooperatively with utilities, utility organizations, and with regulators to encourage and facilitate improvements in power plant productivity. Cooperative projects undertaken with regulatory and energy commissions in California, Illinois, New York, Ohio, Texas, North Carolina and Mighigan are described. Following initiation of these cooperative projects, DOE funded a survey to determine which states were explicitly addressing power plant productivity through the regulatory process. The Working Group was formed following completion of this survey. The Working Group emphasized the need for those power plant productivity improvements which are cost effective. The cost effectiveness of proposed availability improvement projects should be determined within the context of opportunities for operating and capital improvements available to an entire utility. The Working Group also identified the need for: allowing for plant designs that have a higher construction cost, but are also more reliable; allowing for recovery and reducing recovery lags for productivity-related capital expenditures; identifying and reducing disincentives in the regulatory process; ascertaining that utilities have sufficient money available to undertake timely maintenance; and support of EPRI and NERC to develop a relevant and accurate national data base. The DOE views these as extremely important aspects of any regulatory program to improve power plant productivity.

15744 **(EPRI-EM—1716) Introduction of electric vehicles into the utility system: analysis of research needs. Final report.** Bohn, J.G.; Peschon, J. (Systems Control, Inc., Palo Alto, CA (USA)). Feb 1981. 62p. NTIS, PC A04/MF A01.

Electric vehicle penetration prediction models estimate that more than 13 million EVs could be in operation by the year 2000. Depending upon the timing of introduction, location and distribution of these vehicles, a utility's energy and power system could be significantly affected by this new load. Research will be required in EV load characterization and prediction, battery and battery charger technology assessment, generation transmission and distribution systems analysis, load management strategy, financial and regulatory agency perspective and utility/EV interface characterization. These projects will be accomplished through the direct involvement of those utilities that are actively interested in EV technology assessment and demonstration.

15745 **(NP—22592) Electric Utility Rate Design Study: a discussion of a supply-side time-differentiated accounting-cost methodology.** (Main (Charles T.), Inc., Boston, MA (USA)). 14 Nov 1980. 51p. EPRI, Palo Alto, CA.

This report examines (1) traditional non time-differentiated accounting cost (NTDAC) conventions; (2) criteria for evaluating time-differentiated accounting cost (TDAC) methodologies; (3) the base, intermediate, and peak (BIP) method as an example of a supply-side accounting-cost time differentiation; and (4) a recommended TDAC methodology based on a full-availability dispatch (FAD). The term accounting costs denotes those items that appear as cost entries in the records of a utility. These costs, including allowable earnings, constitute the cost of service; namely, operation and maintenance expenses, depreciation, taxes, and return on investment. A TDAC methodology may be fairly evaluated by three criteria: cost relatedness, equity, and stability. Cost-relatedness refers to conformance with accepted notions of cost causation; i.e., the relationship of cost to demand, energy, and customer characteristics. Equity comprises a two-part criterion - technical definability and consistency of application. Technical definability is the equity requirement that the methodology be capable of technical specification. Consistency of application requires that the methodology proceed in a stepwise fashion that is internally consistent. Both equity elements are aimed at minimizing subjectiveness in the allocation process. Stability is a balancing criterion. It requires that the methodology resist changes due to normal-system operation and expansion while retaining responsiveness to customer-initiated changes in system characteristics.

15746 **(NP—22594) Electric Utility Rate Design Study: a framework for evaluating the cost-tracking capabilities of alternative residential rate structures.** (Putnam, Hayes and Bartlett, Inc., Cambridge, MA (USA)). Sep 1980. 76p. EPRI, Palo Alto, CA.

A cost-tracking rate structure is defined here as a tariff which allocates revenue requirements in such a way that the revenues collected from an individual customer closely track the costs which that customer imposes on the utility. A perfect cost-tracking rate structure is not achievable in practice. The proposed framework for tracking costs makes use of regression techniques to design and evaluate rate schedules. A stepwise least-squares regression routine selects the best set of rates for a given rate structure in an essentially unconstrained fashion. This regression procedure has several unique advantages. The methodology was tested empirically using load research and cost-of-service data for residential customers of Virginia Electric and Power Company. Alternative rate structures, both non-seasonal and seasonal, were formulated that require only a simple watthour meter. For each rate structure, flat rates were compared with the optimal block-rate schedule. In addition, innovative rate structures (for example, time-differentiated energy rates and demand-energy rates) were designed and assessed in order to determine whether these rate structures, which require more expensive metering equipment, materially improve cost tracking and the equity of cost recovery. This analysis also permitted determination of whether the cost-tracking performance of time-differentiated energy rates and demand-energy rates would be improved by blocking.

15747 (NP—22595) Electric Utility Rate Design Study: customer acceptance of time-differentiated rates and load controls (Topic Paper 5). Hellman, C. (Temple, Barker and Sloane, Inc., Lexington, MA (USA)). 20 Aug 1980. 96p. EPRI, Palo Alto, CA.

Customer acceptance of time-differentiated rates and load controls was one of numerous topics addressed in the first phase of the Electric Utility Rate Design Study, and one of four selected for further study in Phase II. This topic paper (part of the Phase II effort) provides public and private decision makers with a guide to quantitative customer-acceptance research. Two theoretical and two empirical issues are addressed, namely: what is the role of customer-acceptance research in time-differentiated rate design and load control decisions; how is customer-acceptance research conducted and evaluated; what customer-acceptance research has been conducted recently; and what are the findings of recent customer-acceptance research? Both the theoretical and empirical discussions are intended as starting points for decision makers. The theoretical issues - the role of and a framework for conducting and evaluating customer acceptance research - are addressed in Chapters I and II, respectively. Chapter III contains a brief overview of 18 customer-acceptance studies reviewed in this topic paper (16 from the electric-utility industry, including one not yet published, and two from the telephone industry) as well as more detailed descriptions (background information and findings) of each study. Chapter IV integrates the findings of the studies and discusses the implications of the conceptual framework (Chapters I and II) and the empirical results (Chapter III) for regulators and utilities. A sample (blank) customer acceptance questionnaire is included in an appendix for general reference.

15748 (NP—25276) Electric Utility Rate Design Study: issues in load research (Topic Paper 3). Schaefer, J.C. (Stone and Webster Management Consultants, Inc., New York (USA)). Dec 1980. 126p. EPRI, Palo Alto, CA.

Load research is the examination of the electric-load patterns of a small number of customers and the use of these data to make inference about the usage patterns of a large number of similar customers. Three questions emerge as key issues in load research: why should a utility do load research; how can a utility develop load-research data; and can load-research data be transferred from one utility to another. Following an overview chapter, additional chapters are: The Phenomena Involved in Loads and Load Research; Experimental Design; Collecting Data; Editing, Storage, and Analysis of Load Research Data; Surveys of Past Experience in Load Research; Transferrability of Load Research Data; and Public Utility Regulatory Policies Act of 1978. A glossary is presented.

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 15493

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 15469, 15470, 15471, 15475, 15478, 15479, 15480, 15481, 15488, 15493, 15496, 15556, 15566, 15567, 15718, 15786, 15791

15749 Meeting international needs for renewable energy resources. Christensen, D. (Univ. of Alabama, Huntsville). *Commercial News USA ;* 13-14(Apr 1981).

Dr. Christensen reviews briefly the state of the art of renewable energy resource technology, pointing out that American manufacturers are producing a large variety of components and systems and providing numerous technical services to help ensure that renewable energy resources help to meet an increasng share of US and international energy needs. He notes the US has undertaken one of the most intensive widespread renewable energy programs in the world, investing hundreds of millions of dollars to advance solar and other renewable energies and to improve energy-conservation methods. Hopefully, this large investment will help improve international cooperation and reduce dependence on limited and costly energy sources.

15750 Evaluation of energy-related inventions. Lewett, G.P. (National Bureau of Standards, Washington, DC). *Commercial News USA ;* 15-20(Apr 1981).

On December 31, 1974, Congress passed the Federal Nonnuclear Energy Research and Development Act of 1974. In Section 14 of the Act, the National Bureau of Standards (NBS) was assigned the role of evaluating energy-related inventions and identifying those that may be suitable for potential DOE support. In assigning the evaluation role to NBS, Congress noted that significant inventions frequently come from individual inventors or from small companies. There was concern that, in the competition for Government funds to be dispensed by DOE, the individual inventory and small company might be at a disadvantage. NBS was directed, therefore, to pay particular attention to evaluation of inventions submitted by individual inventors and by small companies. On passage of the Act, NBS began receiving requests for evaluation of inventions. By the time the NBS Office of Energy-Related Inventions (OERI) was established in April 1975 to carry out the evaluation program, more than 100 requests were awaiting evaluation. As of January 31, 1981, OERI has received approximtely 16,405 requests. This article describes the evaluation process designed and implemented by OERI, reports evaluation statistics and results, and comments on the impact of the OERI operation on the stimulation of innovation in energy technology. More than 50% of the inventions address energy-conservation activities with automotive improvements leading the submissions. About 20% of the submissions fall into the solar energy area. About 1.3% of the total requests received can be expected to be recommended for DOE support.

15751 Projections of solar energy utilization: a guide to Federal planning. Bennington, G.E. (The Mitre Corp., McLean, VA). pp 316-330 of Energy policy modeling: United States and Canadian experiences. Volume I. Specialized energy policy models. Ziemba, W.T.; Schwartz, S.L.; Koenigsberg, E. (eds.). Boston, MA; Martinus Nijhoff Publishing (1980).

The Metrek Division of The MITRE Corporation was funded by ERDA/DOE to perform a comparative analysis of the likely utilizations of solar energy and to use this analysis to develop recommendations for planning the research, development, and commercialization of solar energy. Metrek developed an energy data base, a set of scenarios of likely trends in demand and energy prices, and a computer-simulation model. The data base contains engineering cost data on conventional and solar technologies based on the development of comparable generic-system designs derived from a synthesis of the latest available information. The National Energy Plan, as proposed in April 1977, was used as the baseline scenario for the analysis. Projections of solar energy utilization made by computer simulations of regional market decisions to use solar or conventional technologies in each market sector on a year-by-year basis indicate that: (1) solar energy may eventually displace significant quantities of both fossil and nuclear fuels; (2) solar makes significant contributions in all regions; and (3) near-term solar applications are primarily in distributed markets for heating hot water for buildings and for industrial and agricultural processes. 10 references, 6 figures, 4 tables.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

15752 (AD-A—088333) Psuedo-shock as a qualitative model in the investigation of the influence of wall roughness on the performance of supersonic MHD generators. Final report. Lu, P. (Nebraska Univ., Lincoln (USA). Dept. of Mechanical Engineering). Jul 1980. 93p. NTIS, PC A05/MF A01.

A preliminary study, based on an extension of Crocco's pseudo-shock model, has been carried out to explain and predict qualitatively the rather gradual pressure rise in a supersonic MHD generator, to account for the influence of wall roughness on the core flow. A system of non-linear ordinary differential equations is formulated for the wall layer and core, with proper electromagnetic conditions enforced at the interface. Extensive numerical experiments are also presented, which demonstrate indeed the qualitative

link between the theory of MHD pseudo-shock and the observed pressure ramp caused by rough walls.

15753 **(ANL/MHD—80-13) AMPEL experiments: nitric-oxide concentration measurements in a simulated MHD combustion gas.** Dunn, P.F.; Johnson, T.R.; Reed, C.B. (Argonne National Lab., IL (USA)). Dec 1980. Contract W-31-109-ENG-38. 91p. NTIS, PC A05/MF A01.

Results are presented of recent investigations of the effect of secondary combustion on nitric oxide (NO) concentrations in an simulated magnetohydrodynamic (MHD) combustion gas. Forty-one experiments, in which NO concentration measurements were made, were conducted at the Argonne MHD Process Engineering Laboratory (AMPEL). In sixteen of those experiments, secondary air mixed with the primary combustion gas was combusted over two temperature ranges (1500-1800°K and 1700-2000°K). For all clean-fuel experiments conducted, the measured changes in NO concentration that resulted from secondary combustion were predicted to within 10%, using an Argonne modification of the NASA chemical kinetics code. This predictive code was extended to estimate changes in NO concentrations that would occur during secondary combustion in a larger MHD facility. It is concluded that, in addition to mixing and several other factors, the heat loss from the secondary combustion zone strongly influences the amount of NO formed during secondary combustion.

15754 **(ANL/MHD—80-15) GPSAP/V2 with applications to open-cycle MHD systems.** Geyer, H.K. (Argonne National Lab., IL (USA)). Jan 1981. 235p. NTIS, PC A11/MF A01.

A preprocessor technique for performing lumped component system analysis is presented. By employing simple preprocessor statements, system configurations, constraints, and objective functions can easily be established and analyzed. Use is made of M.J.D. Powell's hybrid equation solver and his sequential quadratic programming method for solving constrained optimization problems. The use of recursive calling capability in both equation solver and optimizer makes possible a fast and efficient general methodology for decomposition and analysis of systems. By retaining the build-up Jacobians and Hessians of the constraints and objective functions, and effective means of reducing computing time is developed during parameter studies. Also presented is a collection of simple first-order models used in open-cycle MHD (OCMHD) applications. Examples of simple system configurations and their analysis are included.

15755 **(DOE/ET/10815—50) MHD Coal-Fired Flow Facility. Quarterly technical progress report, April-June 1980.** Altstatt, M.C.; Attig, R.C.; Baucum, W.E. (Tennessee Univ., Tullahoma (USA). Space Inst.). 31 Jul 1980. Contract AC01-76ET10757;AC02-79ET10815. 44p. NTIS, PC A03/MF A01.

Significant activity, task status, planned research, testing, development, and conclusions for the Magnetohydrodynamics (MHD) Coal-Fired Flow Facility (CFFF) and the Energy Conversion Facility (ECF), formerly the Research and Development Laboratory, are reported. CFFF Bid Package construction is now virtually complete. The remaining construction effort is being conducted by UTSI. On the quench system, another Task 1 effort, the cyclone was erected on schedule. On Tasks 2 through 6, vitiation heater and nozzle fabrication were completed, an investigation of a fish kill (in no way attributable to CFFF operations) in Woods Reservoir was conducted, major preparation for ambient air quality monitoring was made, a broadband data acquisition system for enabling broadband data to be correlated with all general performance data was selected, a Coriolis effect coal flow meter was installed at the CFFF. On Task 7, an analytical model of the coal flow combustor configuration was prepared, MHD generator testing which, in part, involved continued materials evaluation and the heat transfer characteristics of capped and uncapped electrodes was conducted, agglomerator utilization was studied, and development of a laser velocimeter system was nearly completed.

15756 **(DOE/ET/10815—54) MHD Coal Fired Flow Facility. Quarterly technical progress report, July-September 1980.** Altstatt, M.C.; Attig, R.C.; Brosnan, D.A. (Tennessee Univ., Tullahoma (USA). Space Inst.). Nov 1980. Contract AC01-76ET10757;AC02-79ET10815. 73p. NTIS, PC A04/MF A01.

Significant activity, task status, planned research, testing, development, and conclusions for the Magnetohydrodynamics (MHD) Coal-Fired Flow Facility (CFFF) and the Energy Conversion Facility (ECF) are described. On Task 1, the first phase of the downstream quench system was completed. On Task 2, all three combustor sections were completed, hydrotested, ASME code stamped, and delivered to UTSI. The nozzle was also delivered. Fabrication of support stands and cooling water manifolds for the combustor and vitiation heater were completed, heat transfer and thermal stress analysis, along with design development, were conducted on the generator and radiant furnace and secondary combustor installation progressed as planned. Under Task 3 an Elemental Analyzer and Atomic Absorption Spectrophotometer/Graphite Furnace were received and installed, sites were prepared for two air monitoring stations, phytoplankton analysis began, and foliage and soil sampling was conducted using all study plots. Some 288 soil samples were combined to make 72 samples which were analyzed. Also, approval was granted to dispose of MHD flyash and slag at the Franklin County landfill. Task 4 effort consisted of completing all component test plans, and establishing the capability of displaying experimental data in graphical format. Under Task 7, a preliminary testing program for critical monitoring of the local current and voltage non-uniformities in the generator electrodes was outlined, electrode metal wear characteristics were documented, boron nitride/refrasil composite interelectrode sealing was improved, and several refractories for downstream MHD applications were evaluated with promising results.

15757 **(DOE/ET/15611—2) Optical diagnostic measurements of coal-slag parameters in combustion MHD systems.** Ariessohn, P.C. (Stanford Univ., CA (USA). High Temperature Gasdynamics Lab.). Aug 1980. Contract AC01-80ET15611. 183p. NTIS, PC A09/MF A01.

Hydrodynamic models have been developed to predict the behavior of slag layers on MHD generator walls and these have indicated a strong dependence of slag layer thickness on a number of system parameters. The first objective of this thesis was the development of a diagnostic technique capable of making continuous, in-situ measurements of the slag layer thickness, and the application of this technique in an MHD system for comparison with the predictions of one of the existing hydrodynamic models. The second objective of this thesis was the development of a diagnostic technique capable of making in-situ measurements of ash droplet size and concentration at the exit of an MHD combustor, and the study of the sensitivity of these quantities to various combustion parameters. A slag layer surface position monitor employing a laser triangulation method has been developed and used to measure variations in slag layer thickness as a function of substrate temperature for a variety of ash loadings and total reactant flowrates. Slag layer thickness is seen to decrease with increasing substrate temperature and plasma velocity. The measurement of mean size and concentration of suspended ash droplets in the plasma exiting the M-8 combustor has been accomplished utilizing a two-wavelength transmissometer developed for this purpose. This instrument incorporates several unique features which were required to overcome the difficulties imposed by the MHD environment. Measurements obtained with this device show that mean ash droplet diameter is relatively independent of ash loading, combustor residence time and combustion stoichiometry, but is a decreasing function of plasma temperature.

15758 **(DOE/ET/15611—3) High magnetic field MHD generator program. Annual report, October 1, 1979-September 30, 1980.** (Stanford Univ., CA (USA). High Temperature Gasdynamics Lab.). Oct 1980. Contract AC01-80ET15611. 204p. NTIS, PC A10/MF A01.

Progress in a theoretical and experimental program designed to investigate MHD channel phenomena which are important at high magnetic fields is described. The areas of research include nonuniformity effects, boundary layers, Hall field breakdown, the effects on electrode configuration and current concentrations, and

studies of steady-state combustion disk and linear channels in an existing 6 Tesla magnet of small dimensions. In the study of the effects of nonuniformities and instabilities, theoretical models have been developed and tested against available data. Experimental facilities, including new diagnostics, have been prepared for forthcoming experiments. Boundary layer measurements and calculations of velocity, temperature, and electron density have been systematically assessed; by accounting for the effect of free-stream turbulence, good agreement is obtained between measurement and theory. An improved laser doppler anemometer has been developed for turbulence damping and velocity profile measurements. Experiments with several insulator designs have shown that conductively cooled insulators can substantially inhibit insulator-induced Hall field breakdown. An improved theoretical model has yielded good agreement with the results of breakdown experiments. Three-dimensional calculations of the effects of electrode configuration on current concentrations have been performed. Reduced current concentrations were found for electrodes with surfaces to the magnetic field. Experiments were conducted at magnetic fields over 5 Tesla for both disk and linear MHD channels.

15759 **Materials and corrosion in MHD systems.** Killpatrick, D.H. (Argonne National Lab., IL). pp 11.1-11.4 of Materials and corrosion problems in energy systems. Lochmann, W.J.; Indig, M. (eds.). Houston, TX; National Association of Corrosion Engineers (1980).

From Energy-sources technology conference; New Orleans, LA, USA (3 Feb 1980).

Magnetohydrodynamics (MHD) technology is based on high-temperature processes in corrosive and erosive environments. Consequently, the selection of materials that will provide reliable performance in an MHD generator for the lifetimes required in commercial power plants, at acceptable cost levels, is extremely difficult.

3002 Ehd Generators

15760 **(AD-A—084125) Analysis of a two-fluid EHD power generator including effects of compressibility.** Gawain, T.H.; Biblarz, O. (Naval Postgraduate School, Monterey, CA (USA)). Jan 1980. Contract ER-78-A-03-2122. 94p. NTIS, PC A05/MF A01.

A detailed analysis and method of calculation is presented for determining the complete thermodynamic cycle of either a one-fluid or a two-fluid electrohydrodynamic (EHD) power generator. The analysis takes fully into account the compressibility of the media. Parameters are included which express the thermodynamic losses in the various components of the overall system. The severe restriction on output created by the electrical breakdown limit of the medium is clearly shown. The method for computing the net-electrical work output per unit mass of primary fluid and the net overall thermal efficiency of the system is carefully developed. The calculation procedure is illustrated by a completely worked out numerical example. The techniques presented here may be used to determine the performance possibilities and limitations of various one-fluid and two-fluid EHD power generators.

3003 Thermoelectric Generators

REFER ALSO TO CITATION(S) 15432

3004 Thermionic Converters

15761 **(TE—4258-81-81) Coal-fired furnace for testing of thermionic converters. Topical report.** (Thermo Electron Corp., Waltham, MA (USA)). Oct 1980. Contract AC02-76ET11292. 22p. NTIS, PC A02/MF A01.

The development of thermionic converter technology has progressed to make near-term applications interesting. One of these applications is the thermionic topping of a pulverized coal-fired central station powerplant. Up to now, thermionic converters have been flame tested using natural gas as fuel. A new test furnace is required for evaluation of thermionic converters in a coal-fired environment. The design and costs of a facility which adapts a coal-fired furnace built by Foster Wheeler Development Corporation (FWDC) for thermionic converter testing are discussed. Such a facility would be exempt from air pollution regulations because of its low firing rate.

15762 **(TE—4258/4247-72-81) DOE/JPL advanced thermionic technology program. Progress report No. 44, July, August, September 1980.** (Thermo Electron Corp., Waltham, MA (USA)). 1980. Contract AC02-76ER11291. 80p. NTIS, PC A05/MF A01.

The primary long-term goal of the DOE effort is to improve TEC performance to the level that thermionic topping of fossil fuel powerplants becomes technically possible and economically attractive. An intermediate goal is to demonstrate an in-boiler thermionic module in the early 1980's. A short-term goal is the demonstration of the reliability of thermionic operation in a combustion environment. The focus of the JPL program is to develop thermionic conversion technology appropriate for nuclear electric propulsion missions. These missions require operation at collector temperatures that are substantially higher than those associated with terrestrial applications. The DOE and JPL tasks for developing thermionic energy conversion are complementary and synergistic. Converter performance improvement is an area in which one agency's program supports the effort of the other. Significant accomplishments in this reporting period are described.

15763 **(TE—4258/4247-149-81) DOE/JPL advanced thermionic technology program. Progress report No. 45, October, November, December 1980.** (Thermo Electron Corp., Waltham, MA (USA)). 1980. Contract AC02-76ER11291. 53p. NTIS, PC A04/MF A01.

This report covers progress made during the three-month period from October through December 1980. During this period, significant accomplishments include: (1) continuing stable output from the combustion life test of the one-inch diameter hemispherical silicon carbide diode (Converter No. 239) at an emitter temperature of 1730 K for a period of over 4200 hours; (2) construction of four diode module completed; (3) favorable results obtained from TAM combustor-gas turbine system analyses; (4) a FERP work function of 2.3 eV was obtained with the W(100)-O-Zr-C electrode; and (5) the average minimum barrier index of the last six research diodes built with sublimed molybdenum oxide collectors was 2.0 eV.

3005 Fuel Cells

15764 **(DOE/ET/13114—T6) Evaluation of distributed gas cooling of pressurized PAFC for utility power generation. Technical progress report No. 4, August-November 1980 (quarterly).** Ahmad, J.; Farooque, M.; Hooper, M.; Maru, H. (Energy Research Corp., Danbury, CT (USA)). 1980. Contract AC01-78ET13114. 27p. NTIS, PC A03/MF A01.

The objective of this program is to provide a proof-of-concept test of a gas-cooled pressurized phosphoric acid fuel cell (PAFC). After initial feasibility tests in shorter stacks, two 10 kW stacks will be tested. Significant progress includes: design of subsystem components for the recirculation loop; fluid dynamic analyses of DIGAS cooling; and seal effectiveness testing of the baseline stack.

15765 **(DOE/NASA/6229—1) Non-noble catalysts and catalyst supports for phosphoric acid fuel cells. 1st quarterly report, August-November 1980.** McAlister, A.J. (National Bureau of Standards, Washington, DC (USA). Metallurgy Div.). Nov 1980. Contract AI01-80ET17088. 13p. (NASA-CR—165221). NTIS, PC A02/MF A01.

Tungsten carbide, which is known to be active for hydrogen oxidation and CO tolerant has a hexagonal structure. Titanium carbide is inactive and has a cubic structure. Four different samples of the cubic alloys W/sub x-1/Ti/sub x/C were prepared and found to be active and CO tolerant. These alloys are of interest as possible phosphoric acid fuel cell catalysts. They also are of interest as opportunities to study the activity of W in a different crystalline environment and to correlate the activities of the surface sites with surface composition. Research is reported.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

REFER ALSO TO CITATION(S) 15749, 15750

3201 Buildings

REFER ALSO TO CITATION(S) 15504, 15733, 15734, 15797, 15798, 15962

15766 **(ANL/ENG—80-07) Emergency building temperature restrictions. Final evaluation.** (Argonne National Lab., IL (USA)). Nov 1980. Contract W-31-109-ENG-38. 309p. NTIS, PC A14/MF A01.

On July 5, 1979, DOE promulgated final regulations of the Emergency Building Temperature Restrictions program, placing emergency restrictions on thermostat settings for space heating, space cooling, and hot water in commercial, industrial, and nonresidential public buildings. The final regulations restricted space heating to a maximum of 65°F, hot water temperature to a maximum of 105°F, and cooling temperature to a minimum of 78°F. A comprehensive evaluation of the entire EBTF program for a nine-month period from July 16, 1979 is presented. In Chapter 1, an estimate of the population of buildings covered by EBTR is presented. In Chapter 2, EBTR compliance by building type and region is reported. Exemptions are also discussed. In Chapter 3, the simulations of building energy use are explained and the relative impact of various building characteristics and effectiveness of different control strategies are estimated. Finally, in Chapter 4, the methodology for scaling the individual building energy savings to the national level is described, and estimated national energy savings are presented.

15767 **(DOE/CS/30367—2) Daylighting design analysis. Project status report No. 2, 1 March-31 December 1980.** Hallagan, W.B.; Lindsey, L.L.; Snyder, M.K. (Butler Mfg. Co., Grandview, MO (USA). Research Center; Princeton Energy Group, NJ (USA)). 1980. Contract FC02-80CS30367. 32p. NTIS, PC A03/MF A01.

Detailed scale model studies regarding daylighting aspects of the passive/hybrid solar test building located at Butler Research Center in Grandview, MO are discussed. The product development program is aimed at providing passive/hybrid system building alternatives for commercial, industrial, and community purchasers of Butler's Landmark pre-engineered metal buildings. Occasioned by recognition, early in the project, that daylighting could strongly influence annual energy consumption in buildings of the targetted use types, scale models of several alternative design configurations, including that of the test building in Grandview, were built and tested. The major design alternatives, test results, and conclusions to date are described.

15768 **(DOE/EIA—0246) Nonresidential buildings energy consumption survey: building characteristics.** (Department of Energy, Washington, DC (USA). Energy Information Administration). Mar 1981. 160p. NTIS, PC A08/MF A01.

This report presents data on the characteristics of nonresidential buildings in the 48 contiguous States and the District of Columbia. The information was collected through personal interviews conducted with building representatives between October 1979 and January 1980. A summary of the survey design, data collection procedures, and techniques used to convert the sample data to national estimates is found in Appendix B. The report contains two major sets of tables. The first set presents estimated counts and percent distributions by building type for selected building characteristics. These building characteristics include: location; structural features; use and occupancy characteristics; types of heating and cooling systems; and types of fuels coming into the building. Building type is given separately for nonresidential and commercial buildings. The second set of tables presents the same building characteristics for all nonresidential buildings by square footage and year of construction. Each set of variables is presented in three types of tables. In the first type, each cell contains an estimated count of buildings in thousands. The second table expresses the buildings in each cell as a percent of a row total, that is, each row sums to 100%. In the third table type, the buildings in each cell represent a percent of a column total (each column sums to 100 percent).

15769 **(DOE/PE/70278—T13) Qualitative assessment of the residential-building-construction market and its implications for the Building Energy Performance Standards program.** Wolff, D.C. (Harvard Univ., Cambridge, MA (USA). John Fitzgerald Kennedy School of Government). Aug 1980. Contract AC01-80PE70278. 29p. NTIS, PC A03/MF A01.

The purpose of BEPS is to force builders and home-buyers to make decisions that are in the national interest as well as their own: decisions which, it is argued, are unlikely to be made without BEPS, given the lack of builder and consumer awareness about conservation, given the existing regulatory framework within which fuels are priced and allocated, and given existing lending practices. BEPS' requirement that energy efficiency be achieved, in addition to its manual on ways of meeting BEPS, should go a long way toward remedying the problem. BEPS can force consumers to see the actual costs of the energy they use in their homes by using state-level marginal energy prices to set Design Energy Budget levels which require the right amount of conservation for each type of house in each region. Finally, it is within the capability of the BEPS framework for the program to modify lending practices to alleviate the first-cost problem posed by BEPS.

15770 **Heating and cooling buildings with coal.** Morgantown, WV; West Virginia Univ. (1979). 436p. (CONF-7908141—).

From Workshop on heating and cooling buildings with coal; Morgantown, WV, USA (16 Aug 1979).

A two day workshop on the feasibility of heating and cooling buildings with coal was held August 16 and 17, 1979, at the Lakeview Inn, Morgantown, West Virginia. It was sponsored by the College of Engineering, West Virginia University and the West Virginia Board of Regents. This workshop provides information concerning the safe and efficient utilization of coal as a fuel for heating and cooling individual buildings or building complexes. Operating and installed cost computation procedures are discussed. Upon completing the workshop, participants will be knowledgable in the various technical aspects to be considered in converting to coal energy and should be capable of reaching a decision regarding the feasibility of converting a particular building or building complex. The course is intended primarily for persons with an engineering background. Eight sections of the proceedings have been entered individually into EDB and ERA. (LTN)

15771 **(LBL—11845) High intensity discharge (HID) solid state ballast program: Phase I. Final report.** Alling, W.R. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Sep 1980. Contract W-7405-ENG-48. 98p. NTIS, PC A05/MF A01.

High-pressure sodium lamps operated at high frequency with solid-state ballasts are compared to the same lamps operated at 60 HZ with conventional core-coil ballasts. The major improvements that the solid-state ballasts show include a 20% increase in system efficacy and a regulated, constant wattage input to the lamps. In addition, the solid-state ballasts can safely dim the HPS lamps over a wide range of light levels. Assuming these improvements, these HPS systems may consume as much as 50% less energy than core-coil systems. Background and history, the program plan, performance characteristics, an energy loss analysis, and a market potential study are presented. Task V is stated as involving constructing, testing, and packaging suitably reliable, representative, engineering protype ballasts, and delivering 6 of the units to LBL. LBL will submit these units to an independent test laboratory to verify the electrical and photometric performance.

15772 **(ORNL/CON—51) MAD: a computer program for ACES design using monthly thermal loads.** Ballou, M.L.; Nephew, E.A.; Abbatiello, L.A. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 138p. NTIS, PC A07/MF A01.

MAD, the computer program for designing and evaluating annual cycle energy systems (ACES) for single-family residences, is described, and the theoretical basis of the program is explained.

The program uses average-year weather conditions to calculate the monthly requirements (loads) for space heating, water heating and space cooling for a specified house design and uses the computed loads to determine sizes and capacity ratings of ACES components. Optimal design sizes are calculated for the following ACES components: ice storage bin, solar-collector panel, mechanical package, blower, and ice-bin heat exchanger. The algorithms used for calculating house loads and for sizing equipment give results in good agreement with actual data obtained at the Knoxville ACES demonstration house. The program computes the monthly power consumption, annual coefficients of performance, and life-cycle costs of the ACES and three conventional, electrically driven space-heating and -cooling systems. The conventional HVAC systems are (1) an electric furnace, central air conditioning, and electric-resistance water heater; (2) an air-to-air heat pump with electric-resistance water heater; and (3) an air-to-air heat pump with a desuperheater water heater. This capability makes possible the comparison of the performance and economics of the ACES with other systems delivering identical energy services to a house. MAD has been used to determine the feasibility of the ACES concept in the various climatic regions of the United States.

15773 **(ORNL/CSD—77) Simulation of a PCM storage subsystem for air conditioning assist.** Solomon, A.D. (Oak Ridge National Lab., TN (USA)). Apr 1981. Contract W-7405-ENG-26. 103p. NTIS, PC A06/MF A01.

A simulation program is described for a latent heat storage subsystem whose purpose is to reduce the conventional air conditioning load of a house. The basic heat balances are given, some simulation results are shown, and broader questions regarding such a simulation are raised.

15774 **(SERI/RR—744-901) Solar energy, conservation, and rental housing.** Levine, A.; Raab, J. (Solar Energy Research Inst., Golden, CO (USA)). Mar 1981. 63p. NTIS, PC A04/MF A01.

Renters must pay the majority of energy costs either directly or in their rents. They have limited financial and legal abilities to make improvements necessary to increase substantially the energy efficiency of rental housing. This report discusses the problem of how to increase investments in energy conservation and solar energy devices for rental housing, which constitutes over one-third of US housing. As background, this report characterizes the rental-housing market, including owners' decision-making criteria. Federal, state, and local policies that affect energy-related investments in rental housing are described. Programs are divided into five major categories: (1) programs for tenants, (2) financial incentives for owners, (3) leasing of solar energy equipment, (4) mediation between tenants and landlords, and (5) regulation. The report concludes that energy and conservation programs aimed at the residential sector must disaggregate owner-occupied housing from rental housing for maximum effect. No one program is advocated since local rental-housing markets differ substantially. For improvements greater than no-cost or low-cost items, programs must be directed at rental-housing owners and not only at tenants.

15775 **(ORNL/tr—4679) Roofing felt on polystyrene.** Isaksen, T.; Paulsen, E.M.; Juul, H. (Oak Ridge National Lab., TN (USA)). Dec 1980. Translation of TPF Informer No. 1, 1979. 30p. NTIS, PC A03/MF A01.

A set of instructions is presented on methods to install compact flat roofs which, on the upper side of the supporting construction, are heat-insulated with expanded polystyrene and covered with roofing paper. Directions are also given for repairing, reroofing, and maintaining the roofs. Possible damage occurring on polystyrene insulated roofs discussed are: cracks and bulges; walking; blisters and bubbles; blow-off of asphalt-bonded insulation and roofing caused by wind. Factors discussed for obtaining durable, serviceable roofs are: roof angle; roof plan; level underlayment for insulating and roofing; expanded polystyrene; roof paper; bonding asphalt; mechanical fasteners; weather conditions during roofing; interior climate/vapor barrier; plan of operation. Current insulation and roofing practices for roofing paper on polystyrene and repair/reroofing/maintenance of old roofs are discussed.

15776 **On load brush cleaning systems for chiller condensers and other tube type heat exchangers.** Vandermolen, J.H.C. (Univ. of Guelph, Ontario). pp 14p, Section 13 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

An on-load brush cleaning system was installed on the 500-ton machine and on one of the 2000-ton Carrier Hermetic centrifugal refrigeration machines at the chiller plant at the University of Guelph. Performance data and results are briefly discussed.

15777 **Energy consumption for refrigeration chillers at the University of Guelph; a comparison with and without automatic tube cleaning.** Leitner, G.F. (Water Services of America, Inc., Milwaukee, WI). pp 14p, Section 14 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

Comparative data are developed for two 2000-ton centrifugal chillers installed at the University of Guelph. One of the chillers was equipped with an automatic tube cleaning system for the condenser tubes. The other was not so equipped. Both chillers were operated for 3000 hours at varying load conditions using a common cooling tower. The evaluation tests that were carried out to determine the effectiveness of the automatic tube cleaning system are described. (MCW)

3202 Transportation

REFER ALSO TO CITATION(S) 15742, 15809, 16252

15778 **(AD-A—084235) National Aviation Fuel Scenario Analysis Program (NAFSAP). Volume I. Model description. Volume II. User manual. Final report.** Vahovich, S.G. (Federal Aviation Administration, Washington, DC (USA). Office of Environment and Energy). Mar 1980. 17p. NTIS, PC A02/MF A01.

This report forecasts air carrier jet fuel usage by body type for three user defined markets. The model contains options which allow the user to easily change the composition of the future fleet so that fuel usage scenarios can be 'run'. Both Volumes I and II are contained in this report. Volume I describes the structure of the model. Volume II is a computer users manual.

15779 **(AD-A—088232) Dynamic air traffic control simulation of profile descent and high-speed approach fuel conservation procedures. Final report Jul 77-Aug 77.** O'Brien, P.J.; Willett, F.M. Jr; Tobias, L. (National Aviation Facilities Experimental Center, Atlantic City, NJ (USA)). May 1980. 125p. NTIS, PC A06/MF A01.

A dynamic simulation of instrument flight rule (IFR) air traffic operations in the Denver, Colorado, terminal area was conducted at the National Aviation Facilities Experimental Center (NAFEC) to investigate aircraft fuel conservation procedures and the compatibilities of these procedures with air traffic control (ATC) and with the expeditious flow of air traffic. The laboratory environment of the NAFEC Air Traffic Control Simulation Facility (ATCSF) was utilized along with two Ames Research Center (ARC) piloted flight simulators. The ARC simulators were interfaced with the ATCSF via a landline system and were flown within the simulated environment together with the NAFEC computer-generated flights. Fuel conservative procedures tested were the profile descent and two high-speed approaches, the delayed flap approach and the International Air Transport Association (IATA) approach. The Denver terminal radar approach control (TRACON) was simulated, and traffic was representative of Stapleton Airport IFR operations. Results showed that, by comparison with conventional procedures, fuel was saved when only the the profile descent procedure was used. Fuel saving with the high-speed approach procedures, as simulated, was questionable. There was an indication of a fuel saving when departure flights were not

restricted to maintaining 250 knots at 10,000 feet and below. Additionally, a graphic study showed that, at landing gross weight conditions, the most desirable holding altitudes were between 20,000 and 30,000 feet. A more in-depth study of the ramifications of computer-aided flight scheduling and latest technology in fuel saving flight procedures is recommended.

15780 **(DOE/CS/40060—T1) Energy conservation in grain (corn) drying with combination high-temperature, low-temperature methods. Final report, July 1, 1978-September 30, 1980.** Morey, R.V.; Gustafson, R.J.; Cloud, H.A.; Walter, K.L. (Minnesota Univ., St. Paul (USA). Agricultrual Experiment Station). Jan 1981. Contract AS02-78CS40060. 53p. NTIS, PC A04/MF A01.

Field drying experiments were carried out during the 1975 through 1978 harvest seasons at the University of Minnesota Rosemount Experiment Station. Several combination drying experiments were conducted each season along with a control (conventional drying) experiment. Based on the results of the field experiments, comparisons of energy requirements for combination and conventional drying were made. Performance of the low-temperature, in-storage phase of combination drying was evaluated using computer simulation. Drying performance using ambient air was compared to performance when small amounts of supplemental heat were added, either solar or constant source heat. Long term weather records were used to evaluate variations in performance from year to year.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 15185, 15239, 15241, 15242, 15243, 15470, 15600, 15603, 15608, 15609, 15610, 15611, 15612, 15725, 15731, 15799, 15961

15781 **(DOE/CS/40300—T2) IEA Energy conservation in the iron and steel industry.** Tunnah, B.G. (Gordian Associates, Inc., New York (USA)). Jan 1981. Contract AC01-79CS40300. 100p. NTIS, PC A05/MF A01.

The NATO Committee on the Challenges of Modern Society research program, under the auspices of the IEA, had the objectives of collecting data on material requirements and energy-consumption patterns in selected energy-intensive industries in the US and Western Europe, of identifying technologies and operating practices with the potential for energy conservation in those industries, and of recommending research projects that could lead to improved energy efficiency. The steel industry was selected for analysis and ideas for an international cooperative program were developed. Representatives from various countries conducted meetings and the form of an implementing agreement for a research and development program was finalized in December, 1980. The program includes three technical areas: hot-surface inspection, heat recovery, and coal gasification. Hot-surface inspection methods to be demonstrated are: optical, induction, electromagnetic ultrasonic, electromagnetic ultrasonic surface testing methods, and eddy current method for hot surface inspection and an infrared system (possibly). Three heat-recovery projects are: ceramic heat wheel development; demonstration of granular bed/heat pipe system for heat recovery; and demonstration of tubular ceramic recuperators. Processes in coal gasification are: converter process, gas treatment, and iron treatment. Each project is described in detail. (MCW)

15782 **(ORNL/TM—7578) Evaluation of tubular ceramic heat-exchanger materials in residual-oil-combustion environment.** Wei, G.C.; Tennery, V.J. (Oak Ridge National Lab., TN (USA)). Mar 1981. 167p. NTIS, PC A08/MF A01.

Fourteen different structural ceramic tubes were exposed to a residual oil combustion environment at 1200°C for 500 h with a total of six thermal cycles. Silicon carbide and alumina ceramics survived the exposure. Best candidates for heat exchanger use in residual oil combustion environments include siliconized silicon carbide, pressureless sintered silicon carbide, and high-purity alumina. Cordierite, mullite, and zirconia-mullite cracked extensively. Molten nodules or deposits of cristobalite, tridymite, and silicate glass containing fuel oil impurities such as Na, Al, Ca, V, Fe, and Ni formed on the upstream side of the SiC-based specimens. Active oxidation proceeds with the release of CO and CO_2 at the interface of the nodules or deposits formed on the SiC. Fuel oil impurities including Fe and Ni reacted with the free Si in siliconzed SiC to form low-melting alloys. Surface roughness and grain growth were observed in pressureless sintered SiC as a result of reactions. Microcracks were observed in chemically vapor deposited (CVD) SiC and CVD SiC on SiC. A thin layer of iron-nickel aluminate formed on the outer surfaces of aluminum oxide tubes. Significant grain growth was observed in the upstream side of the high-purity alumina tubes. The test exposure increased helium permeability of siliconized SiC, pressureless sintered SiC, high-purity alumina, and CVD SiC, but it decreased the air permeability of relatively permeable, porous materials. The room temperature C-ring fracture strength of pressureless sintered SiC and high-purity alumina decreased significantly during the exposure but that of siliconized SiC increased slightly. The thermal expansion of pressureless sintered SiC increased while the thermal expansion of siliconized SiC and high-purity alumina remained constant.

15783 **Modeling energy demand by the paper industry: an economic/engineering approach.** Nguyen, H.D. (Oak Ridge National Lab., TN); Chern, W.S.; Reister, D.B. *Resources and Energy ;* **2**: No. 4, 325-340(Dec 1979).

A model of energy demand by the paper industry conceptually separates the industry into two sectors: pulp and paper production; and energy generation and conversion. The first sector includes the major pulp and paper production processes while the second includes the energy and material balances in converting primary energy sources to steam and electricity. The present model is used to evaluate important energy issues such as future energy demand, fuel substitution, and cogeneration. The base-case-projection results show that total energy consumption will grow much slower than paper production in the next 20 years. Specifically, steam and purchased fuel consumption are projected to increase at much lower rates than total electricity and recovered fuel consumption. The results also show that a coal-conversion program based entirely on price inducement may not be effective as the industry is more inclined to switch from natural gas to oil, rather than coal. 19 references, 2 figures, 6 tables.

15784 **Advancements in on-line leak sealing.** Teller, J.H. (Furmanite, Inc., Virginia Beach, VA). pp 36p, Section 7 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

The basic principle employed is to supplement damaged packing or joining material in the area of the leak through injection of compounds which, when in place, will provide a seal compatible with the joint configuration and the process material being sealed. The application in steam systems is described. The economics of steam losses, pollution control, and noise abatement are discussed. The programming of leak sealing and advancements in technology are also discussed.

15785 **Operating principles and applications of vortex shedding meters.** Guenther, K.L. (Neptune Eastech, Edison, NJ). pp 12p, Section 11 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

The operating principles of vortex shedding flowmeters are summarized and experimental progress at Neptune Eastech is briefly cited. The fact that a vortex meter is capable of measuring flow with no critical moving parts and allows the prediction of meter factor based on measured dimensions makes it an ideal flowmeter for use in many applications. Vortex metering in a large textile company and several automotive facilities are cited. (MCW)

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 15431, 15469, 15470, 15600, 15601, 15602, 15603, 15604, 15605, 15606, 15607, 15608, 15609, 15610, 15611, 15612, 15628, 15975

15786 Design and management for resource recovery. Volume 1. Energy from waste. Frankiewicz, T.C. (ed.). Ann Arbor, MI; Ann Arbor Science Publishers Inc. (1980). 221p.

The 16 chapters in this volume represent a large fraction of the technical presentations made at the July 1979 Engineerng Foundation Conference, Municipal solid waste as a resource: the problem and the promise. This conference was held at a time when commercial interest in recovering resources from solid waste entered a growth phase and when the economics of energy recovery from waste improved dramatically. The purpose of the meeting, in Henniker, NH, was to deal openly with some of the past problems and look to the future to see if in fact the nagging early difficulties could be overcome. A separate abstract was prepared for each of the 16 chapters, all of which were selected for Energy Abstracts for Policy Analysis (EAPA); 2 will appear in Energy Research Abstracts (ERA).

15787 (CONF-810423—3) New directions for district heating in the United States. Olszewski, M.; Karnitz, M.A. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01.

From 1. International Energy Agency (IEA) conference on new energy conservation technologies and their commercialization; Berlin, F.R. Germany (6 Apr 1981).

Within the past five years there has been a growing awareness of the energy conservation and economic advantages of modern hot-water district heating systems. A description is given of the status of major US district heating projects and the potential impact of the newly implemented US National District Heating Plan is examined. At the present time there are five major district heating projects moving into the construction and demonstration phase. Although all have hot water distribution systems a variety of heat sources are being utilized. These heat sources include geothermal water, industrial reject heat, and utility cogeneration using coal-fired power plants.

15788 (SAND—80-7162C) Risk assessment re: beneficial uses of composted sewage sludge. Yeager, J.G.; Hain, K.E. (BDM Corp., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 21p. (CONF-801184—1). NTIS, PC A02/MF A01.

From National conference on municipal and industrial sludge composting; Philadelphia, PA, USA (17 Nov 1980).

Regulations prescribing sludge treatments are defined and restrictions associated with the use of the sludge are discussed. Sludge treated with a Process to Significantly Reduce Pathogens (PSRP) may be spread on agricultural land, but public access must be restricted for 12 months. Sludge treated by a Process to Further Reduce Pathogens (PFRP) can be used without limitations on public access or land use. Sludges treated by high-temperature composting, heat drying, heat treatment, and thermophylic digestion require no prior treatment with a PSRP. Development of a risk analysis tool is described. The tool evaluates the risks to public health associated with sludge use.

15789 Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979). 577p. (CONF-790659—).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

Separate abstracts are prepared for 18 papers presented at the conference. Two papers had previously appeared in the appropriate DOE data bases. (MCW)

15790 (AD-A—084211) How to compute complex interconnected district heating systems. Wehr, R.; Tautz, A. Translated from *Fernwaerme International ;* **8**: No. 5, 247-252(Mar 1980). 15p. NTIS, PC A02/MF A01.

The cost-intensive extension of urban district heating systems demands a relatively accurate assessment of the distribution apparatus with respect to the heating market to be supplied. Here we consider the plans of currently available computer programs which can reproduce with practical approximation the operating conditions of complicated interconnected heating networks. Along with the validity of the program, the quality of its application is equally critical; and this application requires a meticulous analysis of parameters such as line resistances, temperature conditions and load distribution.

15791 Municipal solid waste comminution by steam explosion. Burke, J.A. Jr. (Burke, Davoud & Associates, Richmond, VA). pp 141-147 of Design and management for resource recovery. Volume 1. Energy from waste. Frankiewicz, T.C. (ed.). Ann Arbor, MI; Ann Arbor Science Publishers Inc. (1980).

Results of a program with pilot-sized equipment are described. A 200-psi steam discharge reduces paper and other organic materials to very small sizes. The extent of reduction of metal and glass containers depends on pressure. The advantages of explosive decompression are described. Residual energy from the explosion is conserved and reused in downstream processes. With steam, heat is retained for bioconversion. With dry gases momentum of discharging gas and refuse is used for separation of refuse-derived fuels (RDF). Discharges have low abrasion; hence, equipment is subject to low maintenance.

15792 Statistical Committee report of industry statistics for 1978. pp 27p, Section 5 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

The statistical report for 1978 is based on data supplied by 44 district heating systems. It consists of a tabulation of statistics on steam sold, spare capacity, generation, fuel, and revenue. Data are compared with data from the past three years. It is noted that there are no uniform rules for compilation of data.

15793 Retrofitting steam-electric plants to supply heat for district heating. Saleta, V.A.; Ulfstam, R.P.; Tourin, R.H. (Stone and Webster Engineering Corp., New York, NY). pp 21p, Section 9 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

Progress is reported on a study of existing fossil-fired power stations to determine the preferred method for converting them to supply district heating and cooling for communities. Specifics of a study for developing district heating and cooling systems in the northern New Jersey service territory are given. The study applies primarily to larger, more recent units with reheat capability. Options for transferring heat from power plant steam to the district heating water and heat distribution schemes for the four plants in New Jersey being studied are discussed. Water was determined to be the preferred medium for distribution of heat to the communities. (MCW)

15794 Energy cost of comfort cooling. Farkas, G.S. (Shawinigan Energy Consultants Ltd., Mississauga, Ontario). pp 16p, Section 10 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

With emphasis on energy economics, not fiscal economics, the energy conversion performance of various cooling techniques are compared. The method computes the amount of primary energy required to produce one ton refrigeration (T.R.) cooling effect. This can be considered the energy cost of cooling. In terms of this cost, wide variations exist between absorption and compressor refrigeration and their combinations. Several alternatives are examined, four using conventional technique, which exist in most contemporary buildings and central cooling systems. The remaining three alternatives are examples of cogeneration schemes, which

have been studied for specific Canadian applications. The alternatives are ranked in terms of energy cost. Observations on compatibility and probable fiscal economics conclude the paper.

15795 **Recovery of energy from municipal solid waste: a review of activity in North America.** Sussman, D.B. (Environmental Protection Agency, Washington, DC). pp 30p, Section 15, Paper 2 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

The past several years have seen a tremendous increase in interest in recovering energy from municipal solid waste. The various alternatives are reviewed and attempt is made to place them in perspective with regard to their status in North America. The three alternatives of utmost current interest for members of the International District Heating Association are: mass burning of unprocessed solid waste in heat recovery furnaces (waterwall combustion units); the mechanical conversion of the organic portion of municipal solid waste into a refuse-derived fuel (RDF) that is combusted as a primary fuel in a dedicated boiler or as a supplemental fuel along with coal in an existing boiler; and the conversion of solid waste to other fuel forms through pyrolysis. Each of these alternatives is described briefly along with status reports on selected systems actually in operation in different cities throughout the United States and Canada.

15796 **Resource recovery/district heating systems: prospects and problems.** Barnett, T.M.; Price, J.D.; Gershman, H.W. (Gordian Associates Inc., Washington, DC). pp 16p, Section 15, Paper 3 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

Approaches to achieve compatibility of resource recovery and district heating systems are discussed. Solid waste processing plants at Saugus, Massachusetts, Harrisburg, Pennsylvania, and several smaller modular incinerator sites are already selling steam, while the facility of Nashville, Tennessee and one planned for Akron, Ohio are based on steam-producing components designed specifically for district heating and cooling. Performance records of other systems are cited. The potential compatibility of resource recovery with district heating systems has not developed to the extent that may seem warranted. An examination is made of the potential, and addresses some of the economic, financial, and institutional considerations which impact on the establishment of such projects.

15797 **Use of Charlottetown municipal waste to energize the new Queen Elizabeth Hospital.** Pregel, G. (ECE Group, Don Mills, Ontario). pp 24p, Section 15, Paper 4 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

The concept of using solid waste extracted energy to supply energy to the new Queen Elizabeth Hospital in Prince Edward Island and features of the proposed plant are described. The municipal waste from Charlottetown will be incinerated in multiple-chamber incinerators of the starved-air thermal destruction type in a manner not detrimental to the environment. Heat from the flue gases will be extracted in two waste heat recovery units and generate high pressure superheated steam. The recovered waste heat will be used within the plant for pre-heating of boiler feed water and other heating applications. Schematics of the system are shown and data on energy balance and efficiency are tabulated.

15798 **Physical plant of the University of Riyad, Saudi Arabia.** Hansen, E.G. (Syska and Hennessy, Inc., New York, NY). pp 29p, Section 16 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

A description of the physical plant at the campus of the University of Riyad is presented. Constructed ahead of the main campus was the Faculty of Medicine's Medical Center. The Center is dependent on the main campus system for all its utilities services. Design philosophy and problems arising from differing design concepts are discussed. A large central system was designed for compatibility with an existing facility. The types of system that were evolved and the reasons for their selection at the University of Riyad are discussed in detail with emphasis placed on the central heating system. Requirements of Faculty of Medicine complex, compatibility of concepts and impact of Faculty of Medicine design on district system; basic principles of selected system design; a description of the medium-temperature water system; and equipment selection are specific subjects discussed. (MCW)

15799 **Energy conservation through effective water treatment.** Gray, J.A. (Dearborn Chemical Company, Ltd., Mississauga, Ontario). pp 61p, Section 17 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

Seven major water conditioning systems or programs that can significantly reduce a steam plant's energy requirements are described. Installation of various types of ion exchange dealkalizers, a demineralizer, a hot lime-zeolite softener, or a reverse osmosis system for externally treating a raw water supply can reduce energy requirements. Other programs include: maintaining highest possible feedwater temperature in conjunction with selective oxygen scavenging agents; following ASME boiler water guidelines for boiler blowdown control; installation of a flash tank and heat recovery equipment for boiler blowdown; reducing or preventing objectionable boiler scale deposits; recovering maximum possible condensate returns for boiler feedwater; and maintaining a corrosion-free steam-condensate return system.

15800 **The Minnesota Project.** Barnes, M.H. pp 26p, Section 20, Paper 1 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

A survey of all steam turbine power plants in Minnesota was made to identify plants that could be retrofitted for district heating. Results show that promising communities are Red Wing, Moorhead, and Fergus Falls. The site identification process; retrofit strategies; distribution systems and building conversions assessments; and thermal market and economic analysis considerations are described.

15801 **District heating and cooling systems for communities through power plant retrofit and distribution network, phase I.** Englesson, G. pp 11p, Section 20, Paper 2 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

An assessment of the feasibility of district heating through power plant retrofitting for the city of Philadelphia is described. The first phase effort has uncovered no technical obstacles in the demonstration project and it appears that under certain conditions the project is financially feasible as well. The proposed district heating would be achieved by converting the four fossil-fired units at Eddystone to provide hot water through a two-pipe transmission system to about 157,000 residential and commercial buildings to

South and Southwest Philadelphia to provide space heating and domestic hot water. Cost requirements are briefly discussed. (MCW)

15802 Result of the DOE sponsored district heating study in Detroit. Root, T.E. (Detroit Edison Co., MI). pp 20p, Section 20, Paper 3 of Seventieth annual conference of the International District Heating Association. Official proceedings. Pittsburgh, PA; International District Heating Association (1979).

From International district heating association 1979 annual conference; Dixville Notch, NH, USA (19 Jun 1979).

An analysis was performed to assess the feasibility of supplying energy needs of the Detroit community through district heating and cooling. The first step identified the service area under the constraint that it be within the city of Detroit and in close proximity to the candidate plant. The load within the service area was defined for the five categories of end-users chosen: general and major residential, commercial, institutional, and industrial. Institutional requirements were carried out. The capacity of the retrofitted power plant was determined as a basis for sizing the distribution systems and for determining which end-user loads could be served. Distribution systems were developed on an incremental basis to simulate the actual growth pattern of such a system and were tested with the economic analysis to establish the optimum service area to produce the minimum cost to the end-user and a reasonable payback to the system owner.

3209 Education And Public Relations

REFER ALSO TO CITATION(S) 16327

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 15806, 15807

15803 High temperature, low expansion, corrosion resistant ceramic and gas turbine. (to Dept. of Energy). US Patent Application 141,507. 18 Apr 1980. 12p.

The present invention relates to ZrO_2 - MgO - Al_2O_3 - SiO_2 ceramic materials having improved thermal stability and corrosion resistant properties. The utilization of these ceramic materials as heat exchangers for gas turbine engines is also disclosed.

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 15744

15804 (DOE/R5/10157—2) Electric moped. Ferschl, M.S. (Ferschl (Michael S.), Milwaukee, WI (USA)). 26 Feb 1981. Contract FG02-79R510157. 37p. NTIS, PC A03/MF A01.

Two electrically powered mopeds were designed and built. These vehicles offer single-person transportation which is convenient, quiet, low-cost, smooth, and pollution-free. The first moped has a 12 volt electrical system. The second has a 24 volt electrical system. They both have top speeds of about 20 miles per hour. They both use transistorized speed controls and deep-discharge, lead-acid batteries. These mopeds were put through a 750 mile test program. In this program, the 12 volt bike had an average range of nine miles. The 24 volt bike, with a smaller battery capacity, had an average range of six miles.

15805 (UCRL—53089) Advanced electric vehicle. O'Connell, L.G. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). Jul 1980. Contract W-7405-ENG-48. 20p. NTIS, PC A02/MF A01.

The Advanced Electric Vehicle is defined as an automobile which can fulfill the general-purpose role of today's internal-combustion-engine-powered car without utilizing petroleum fuels directly. it relies principally on the utilization of electricity. A number of candidate systems are described. The present status of each is discussed as are the problems to be overcome before implementation can proceed.

15806 (UCRL—85605) Aluminum-air batteries for vehicles. Behrin, E.; Cooper, J.F. (Lawrence Livermore National Lab., CA (USA)). 23 Feb 1981. Contract W-7405-ENG-48. 15p. (CONF-810423—1). NTIS, PC A02/MF A01.

From 1. International Energy Agency (IEA) conference on new energy conservation technologies and their commercialization; Berlin, F.R. Germany (6 Apr 1981).

The aluminum-air battery is an advanced electrochemical energy source in the early stages of development. The battery is potentially capable of providing an electric vehicle with the range, acceleration, and rapid refueling capability of today's automobile. The Lawrence Livermore National Laboratory leads this DOE-funded program with a major part of the research being conducted by industrial laboratories. Peak cell energy yields above 4 kWh/kg-Al and peak power densities greater than 6 kW/m^2 have been demonstrated in single cells. Projected energy density and power density of a complete vehicle battery are greater than 300 Wh/kg and 150 W/kg. The concept, technical status, development strategy, and the results of battery and vehicle analyses are reviewed.

3307 Emission Control

REFER ALSO TO CITATION(S) 15810, 15811, 16124

15807 (AD-A—084396) Development and testing of a resonance source gas filter correlation spectrometer. Final report Aug-Sep 79. Fisher, C.J.; Bryson, R.J. (Arnold Engineering Development Center, Arnold Air Force Station, TN (USA)). May 1980. 26p. NTIS, PC A03/MF A01.

The development and testing of a resonance source gas filter correlation spectrometer for carbon monoxide concentration measurement in high temperature, possibly acoustically and optically noisy combustion systems are described. The instrument incorporates a microwave-excited, low-pressure carbon monoxide plasma radiation source. The operation, calibration, and modeling of the instrument response as well as application to the measurement of CO concentration in the exhaust of a jet engine combustor are described. The report concludes with suggestions for the further use and development of the instrument.

15808 (AD-A—084544) Remote sensing of turbine engine gases. Final report 15 Jul 78-30 Sep 79. Mooradian, A.; Killinger, D.K.; Menyuk, N. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 30 Sep 1979. Contract F19628-78-C-0002. 84p. NTIS, PC A05/MF A01.

This document is the final report for a laser remote sensing research program. The research conducted was designed to develop and demonstrate laser remote sensing techniques for monitoring jet aircraft exhaust gases. This effort was part of a larger program to develop remote sensing techniques for environmental monitoring and tactical detection and discrimination. The specific tasks which were performed consisted of the following: (1) development of an improved repetition rate miniature CO_2 TEA laser and incorporation into a differential-absorption LIDAR(DIAL) system, (2) laboratory demonstration of the frequency-doubled CO_2 TEA laser system by differential-absorption measurements of known gas samples (CO and NO), and (3) initial field feasibility demonstration of laser remote detection of CO in vehicular exhaust (automobile, tractor mower and Skycrane helicopter) at ranges up to 2.5 km. Each of these tasks is described in detail in the following sections of this report. In addition, supportive documentation is included in the accompanying appendices.

3308 Alternative Fuels

15809 (EGG-TRAN—5291) Propane conversion in the vehicle fleet at the Idaho National Engineering Laboratory. Crone, J. (EG and G Idaho, Inc., Idaho Falls (USA)). Dec 1980. Contract AC07-76ID01570. 10p. NTIS, PC A02/MF A01.

One hundred fifty-seven pickups, 9 three-ton trucks, and 3 jeeps were converted from gasoline to propane at the Department of Energy's Idaho National Engineering Laboratory during FY-1980. The conversion to propane has reduced use of gasoline during the FY-1980 transition period by 111,000 gal, and has lowered the fuel cost by $63,000, based on cost of gasohol (which has otherwise replaced gasoline). The Transportation Division estimates total gasoline savings for the year (which include the propane conversion, the switch to gasohol, and a mileage reduction of 8%) to be 196,000 gal of gasoline, or 32% less than FY-1979 consumption. The rate of fuel-cost savings indicate that the payback of the conversion cost for all 170 vehicles ($165,896) will be made approximately 2 to 5 y.

15810 **(PB—80-180672) Evaluation of XRG Number 1: a fuel additive. Technical report.** Barth, E.A. (Environmental Protection Agency, Rockville, MD (USA)). Feb 1980. 16p. NTIS, PC A02/MF A01.

The Environmental Protection Agency receives information about many systems which appear to offer potential for emission reduction or fuel economy improvement. EPA invites developers of such systems to provide technical and test data on the system. In those cases for which review by EPA technical staff suggest that the data available shows promise, attempts are made to schedule tests at the EPA Motor Vehicle Emission Laboratory. The results of all such test projects are set forth in a series of Test and Evaluation Reports, of which this report is one. In February, 1978 the EPA tested NRG No. 1, a fuel additive developed and marketed by NRG International, Inc. of Clayville, New York. Contrary to NRG's claims, the test results showed 'neither a general increase in fuel economy nor a decrease in emissions associated with the addition of NRG No. 1 to the fuel.' In response to a request from the Federal Trade Commission for more in-depth information on NRG No. 1 (now referred to as 'XRG No. 1'), this new series of tests was performed.

15811 **(PB—80-810948) Automobile air pollution: automotive fuels. 1970-May, 1980 (citations from the NTIS Data Base). Report for 1970-May 80.** Cavagnaro, D.M. (Office of the Publication Board, Washington, DC (USA)). Jun 1980. 156p. NTIS PC N01/MF N01.

The use of fuels and fuel additives to reduce pollution from automobiles is covered in this bibliography. The use of methyl alcohol, natural gas, methane, and hydrogen is reported. Improvements to gasoline and its properties which affect air pollution are discussed, along with studies on lead additives. (This updated bibliography contains 147 abstracts, 10 of which are new entries to the previous edition.)

36 MATERIALS

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 15182, 15195, 15198, 15206, 15207, 15209, 15211, 15330, 15332, 15553, 15621, 15650, 15651, 15655, 15669, 15686, 15759, 15839, 15861, 15948, 16320

15812 **(CONF-800205—15) Uses of AES and RGA to study neutron-irradiation-enhanced segregation to internal surfaces.** Gessel, G.R.; White, C.L. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01.

From American Institute of Metallurgical Engineers meeting; Las Vegas, NV, USA (Feb 1980).

The high flux of point defects to sinks during neutron irradiation can result in segregation of impurity or alloy additions to metals. Such segregants can be preexisting or produced by neutron-induced transmutations. This segregation is known to strongly influence swelling and mechanical properties. Over a period of years, facilities have been developed at ORNL incorporating AES and RGA to examine irradiated materials. Capabilities of this system include in situ tensile fracture at elevated temperatures under ultra-high vacuum 10^{-10} torr and helium release monitoring. AES and normal incidence inert ion sputtering are exploited to examine segregation at the fracture surface and chemical gradients near the surface.

15813 **(CONF-800402—20) Structural relationships in rare earth-transition metal hydrides.** Dunlap, B.D.; Viccaro, P.J.; Shenoy, G.K. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 13p. NTIS, PC A02/MF A01.

From International symposium on the properties and applications of metal hydrides; Colorado Springs, CO, USA (7 Apr 1980).

Several structural types of form AB_2, AB_3, A_2B_7, and AB_5 (A = rare earth, B = transition metal) are known to be closely related, with local environments which are very similar among the different compounds. Based on these relationships, we suggest that hydride phases A/sub l/B/sub m/H/sub n/ should be related according to the relationships $n(AB_3) = 1/3n(AB_5) + 2/3n(AB_2)$ and $n(A_2B_7) = n(AB_5) + n(AB_2)$ where the n(AB/sub m/) are observed hydrogen phase concentrations. It is shown that the phases observed in pressure-composition isotherms for AB_3 and A_2B_7 systems can be understood from this viewpoint. A discussion is given of the maximum hydrogen concentration possible in the compounds having these structure types.

15814 **(CONF-810402—8) Long-term corrosion of Cr-Mo steels in superheated steam at 482 and 538°C.** Griess, J.C.; DeVan, J.H.; Maxwell, W.A. (Oak Ridge National Lab., TN (USA); NUS Corp., Clearwater, FL (USA)). 1980. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01.

From Corrosion/81 annual meeting; Toronto, Canada (6 Apr 1981).

The corrosion of several Cr-Mo ferritic steels was investigated in superheated steam at an operating power plant. Tests were conducted at 482 and 538°C (900 and 1000°F) in a once-through loop for times up to 28,000 h. Chromium concentrations ranged from 2.0 to 11.3%, and the effect of surface preparation on corrosion was investigated. Only one of many specimens showed evidence of exfoliation at 482°C, but at 538°C exfoliation occurred on at least some of the specimens of most materials; the exceptions were the alloy with the highest chromium content (Sandvik HT-9), one heat of 9 Cr-1 Mo steel with the highest silicon content, and Sumitomo 9 Cr-2 Mo steel, which was in test for only 19,000 h. Parabolic oxidation kinetics adequately described the corrosion process for about the first year, after which corrosion rates were constant and lower than predicted from extrapolation of the initial part of the penetration versus time curves. With chromium concentrations between 2 and 9%, corrosion behavior was independent of chromium content, and corrosion was only slightly less with Sandvik HT-9. Corrosion was nearly independent of surface preparation, but in two cases the presence of mill scale on the surface prior to steam exposure seemed to retard oxidation in steam. 11 figures, 5 tables.

15815 **(DOE/ER/02872—5) Hydrogen attack of pressure-vessel steel. Progress report, April 1, 1980-March 31, 1981.** Shewmon, P.G. (Ohio State Univ., Columbus (USA). Dept. of Metallurgical Engineering). Dec 1980. Contract AS02-76ER02872. 11p. NTIS, PC A02/MF A01.

The nucleation and growth of methane bubbles in the hydrogen attack of pressure vessel steel has been shown to obey models developed to describe the growth of bubbles limiting the creep ductility of metals. This has been done through studies of the effect of prior deformation on bubble nucleation as well as the effect of methane pressure (stress) and temperature on growth kinetics. A comprehensive model of the factors limiting growth has been developed. Its application to the hydrogen attack of a 2 1/4 Cr-1 Mo steel leads to several interesting predictions.

15816 **Materials and corrosion problems in energy systems.** Lochmann, W.J.; Indig, M. (eds.). Houston, TX; National Association of Corrosion Engineers (1980). 211p. (CONF-800204—(Vol.1)).

From Energy-sources technology conference; New Orleans, LA, USA (3 Feb 1980).

Separate abstracts are included for each of the papers presented concerning the corrosion and erosion of metals and ceramics related to energy sources and used in energy conversion equipment. Two papers have previously been input to the Energy Data Base.

15817 (GA-A—15674) Effects of a range of machined and ground surface finishes on the simulated reactor helium corrosion of several candidate structural materials. Thompson, L.D. (General Atomic Co., San Diego, CA (USA)). Feb 1981. Contract AT03-76ET35301. 45p. NTIS, PC A03/MF A01.

This report discusses the corrosion behavior of several candidate reactor structural alloys in a simulated advanced high-temperature gas-cooled reactor (HTGR) environment over a range of lathe-machined and centerless-ground surface finishes. The helium environment contained 50 Pa H_2/5 Pa CO/5 Pa CH_4/<0.05 Pa H_2O (500 μatm H_2/50 μatm CO/50 μatm CH_4/<0.5 μatm H_2O) at 900°C for a total exposure of 3000 h. The test alloys included two vacuum-cast superalloys (IN 100 and IN 713LC); a centrifugally cast austenitic alloy (HK 40); three wrought high-temperature alloys (Alloy 800H, Hastelloy X, and Inconel 617); and a nickel-base oxide-dispersion-strengthened alloy (Inconel MA 754). Surface finish variations did not affect the simulated advanced-HTGR corrosion behavior of these materials. Under these conditions, the availability of reactant gaseous impurities controls the kinetics of the observed gas-metal interactions. Variations in the near-surface activities and mobilities of reactive solute elements, such as chromium, which might be expected to be affected by changes in surface finish, do not seem to greatly influence corrosion in this simulated advanced HTGR environment. 18 figures, 4 tables.

15818 (HEDL-SA—2161) Stability of γ' and γ'' in inconel 706 under neutron irradiation. Thomas, L.E. (Hanford Engineering Development Lab., Richland, WA (USA)). 2 Sep 1980. Contract AC14-76FF02170. 29p. NTIS, PC A03/MF A01.

Inconel 706, a commercial γ'-γ'' hardenable Fe-Ni-Cr base superalloy was examined by transmission electron microscopy after neutron irradiation up to 15 x 10^{22} n/cm^2, E > 0.1 MeV, at 400 to 735°C. Compared with other γ'-hardened superalloys, this alloy is exceptionally resistant to irradiation-induced swelling and creep. Phase instabilities found after irradiation include the replacement of γ'' by γ' at 400 to 500°C, and redistribution of γ' and γ'' to irradiation-induced dislocations at 550 to 650°C. These instabilities are shown to result from segregation of nickel and niobium to point defect sinks. The dislocations formed during irradiation are extrinsic Frank partial loops which grow within γ'; stacking faults produced by growth of these dislocations are identifical to thin sheets of eta-phase.

15819 (IS-T—907) Investigation into the preparation of rare earth metals by carbothermic reduction in tin. Lyons, L.S. Jr. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 65p. NTIS, PC A04/MF A01.

Thesis.

The reduction of Nd_2O_3 and Gd_2O_3 by C in a Sn solvent was investigated over the temperature range 1585-1760°C and a vacuum of 10^{-5} torr. Reduction of Nd_2O_3 by C was accomplished by heating at 1700°C for 17 hours under a vacuum of 10^{-5} torr. Nd-Sn alloys prepared in this manner contained 0.7% C and 0.06% O. The reduction of Gd_2O_3 by C in a Sn solvent was accomplished by heating at 1760°C for 17 hours under a vacuum of 10^{-5} torr. The Gd-Sn alloys prepared under these conditions contained ~ 1.8% C and 0.3% O. All efforts to vacuum distill Sn from Nd-Sn and Gd-Sn alloys were unsuccessful.

15820 (IS-T—921) Lattice dynamics in the α-phase of the IVB transition elements. Arch, D.K. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 215p. NTIS, PC A10/MF A01.

Inelastic neutron scattering techniques have been used to study the temperature dependent lattice dynamics of the group IVB transition elements, titanium (Ti) and hafnium (Hf), in the hcp (α) phase. In these studies the dispersion curves as well as their temperature dependence were investigated in order to obtain information about the temperature dependence of the thermophysical properties of these elements as well as the change with temperature of the electronic response to the nuclear motions. The data for hcp Ti and hcp Hf were used to evaluate the lattice specific heat at constant pressure as a function of temperature. The calculated total specific heat, obtained by taking into account the electronic contribution, was found to agree rather well with direct specific heat measurements.

15821 (IS-T—942) Hardness tests on irradiated pressure vessel steel. Harvey, D.J. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 76p. NTIS, PC A05/MF A01.

Thesis.

This investigation can be summarized by the following conclusions: the three heats of pressure vessel steel all showed, approximately, a 10% increase in the average weld metal hardness when irradiated to a fluence of about 1 x 10^{18} n/cm^2, E > MeV; the activation energy, as determined by the Meechan-Brinkman method, for the recovery of radiation induced hardness was found to be 0.60 +- 0.06 eV; and the activation energy of 0.6 eV is approximately equal to that calculated for vacancy migration in alpha iron, suggesting that the radiation-produced defect clusters are vacancy in nature.

15822 (IS-T—943) KKR calculation of the electronic structure of cubic WO_3 and $NaWO_3$. Kopp, L. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 92p. NTIS, PC A05/MF A01.

Thesis.

Explanation of the metallic properties of the sodium tungsten bronzes has provoked considerable controversy. The main point of contention has concerned which atomic orbitals constitute the conduction band. At least five models have been proposed. These have involved the tungsten 6s states (2), sodium 3p states (3), tungsten 5d (t/sub 2g/) states (4), sodium states (5), and a covalent admixture of oxygen 2p/sub π/ and tungsten 5d (t/sub 2g/) states (6) in the conduction process.

15823 (LA-UR—81-623) Dynamic material property measurements using an improvement of the freely expanding ring technique. Duffey, T.A.; Karpp, R.R.; Warnes, R.H.; Jacobson, J.D.; Carden, A.E. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810507—1). NTIS, PC A02/MF A01.

From Society for Experimental Stress Analysis meeting; Dearborn, MI, USA (31 May 1981).

Improvements to the expanding ring test for determination of dynamic material properties are described. The improvements alleviate previous difficulties associated with double-differentiation of ring displacement-time data. The technique is illustrated utilizing 6061-0 and 6061-T6 aluminum rings expanded well into the plastic range at strain rates up to 10^4/s. Two-dimensional numerical investigations of the expansion process qualitatively predict observed results and clarify the range over which data is useful for determining material properties.

15824 (ND-R—512(S)) Creep-fatigue behavior of four casts of Type 316 stainless steel. Wareing, J. (UKAEA Springfields Nuclear Power Development Labs.). Jan 1981. 30p. NTIS (US Sales Only), PC A03/MF A01.

Work performed under United States-UKAEA Fast Reactor Exchange Program.

Low-cycle fatigue tests including hold periods up to 24 h at maximum tensile strain have been conducted on four casts of Type 316 stainless steel in the temperature range 570 to 625°C. These resulted in failure times up to 4000 h. In general fatigue life is reduced as the hold period increases, but the extent of life reduction varies from material to material and with test temperature. For two casts of material this initial life reduction is followed by an increase in life as hold periods are extended. The results are rationalized in terms of prevailing fracture processes, and the implication for the extrapolation of short-term data is discussed.

15825 (NUREG/CR—1392) Evaluating strength and ductility of irradiated Zircaloy, Task 5. Quarterly progress report Apr-Jun 79. Lowry, L.M.; Markworth, A.J.; Perrin, J.S.; Landow, M.P. (Battelle Columbus Labs., OH (USA)). May 1980. 41p. (BMI—2049). NTIS, PC A03/MF A01.

The Lot 4 material (Oconee I, Three Cycle) was received, visually examined and gamma scanned. The four rods were Babcock and Wilcox (BandW) fuel rods irradiated in the Oconee I reactor, sectioned at BandW, and shipped to Battelle Columbus Lab-

oratories (BCL) in the shipping cask BCL-4. Specimens for tensile, expanding mandrel, tube-burst, and transient heating burst tests were prepared from the Lot 4 rods. Burst tests were conducted using unirradiated Oconee I archive fuel rod cladding material. Additional burst tests were conducted using Lot 2 (Oconee I, One Cycle) irradiated Zircaloy fuel rod cladding. Also, burst tests were conducted using Lot 3 (Oconee I, Two Cycle) Zircaloy fuel rod cladding. A comparison of Oconee I archive, one cycle, and two cycle tube-burst test results is included. Modeling studies are continued using a number of constitutive equations fitted to the BCL tensile data using a nonlinear-regression-analysis computer code developed at Battelle and based on the Marquardt algorithm.

15826 **(PNL-SA—8955) Remotely operated Inductoslag melting process for consolidation of reactive metal scrap.** Nelson, R.G.; Montgomery, D.R.; Courtright, E.L. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Oct 1980. Contract AC06-76RL01830. 18p. (CONF-8010165—1). NTIS, PC A02/MF A01.

From American Vacuum Society international industrial seminar on pilot plant experiences: melting and processing technology; Seabrook Island, SC, USA (13 Oct 1980).

The Inductoslag melting process is adaptable to the remelting of clean Zircaloy-4 scrap material into nuclear-grade ingots at acceptable melting rates. This process is capable of being adapted for remote operation. The process should also have general industrial potential for remelting reactive metal scrap materials to produce high-quality ingots. Inductoslag melting could also be used to produce stainless steel ingots from reasonably oxide-free general-purpose scrap materials. 5 figures.

15827 **(SAND—80-1917) Experimental aspects of an investigation of macroscopic ductile failure criteria.** Soo Hoo, M.S.; Benzley, S.E.; Priddy, T.G. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 41p. NTIS, PC A03/MF A01.

Experimental results for the ductile failure of 7075-T651 aluminum are presented. Four separate shapes were tested to investigate the importance that macroscopic effective shear stress, hydrostatic stress, and plastic strain play in describing ductile failure of materials. The specimens used were: thin wall torsion tubes to create a state of pure shear, uniform hollow tubes to create a state of uniaxial stress; hour-glass shaped hollow tubes to create a state of biaxial stress; and notched round bars to create a state of triaxial stress. Two proposed ductile failure criteria are discussed in conjunction with the experimental results presented.

15828 **(SAND—80-2302) Physical and mechanical properties of cast 17-4 PH stainless steel.** Rack, H.J. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 63p. (TTC—0161). NTIS, PC A04/MF A01.

The physical and mechanical properties of an overaged 17-4 PH stainless steel casting have been examined. The tensile and compressive properties of cast 17-4 PH are only influenced to a slight degree by changing test temperature and strain rate. However, both the Charpy impact energy and dynamic fracture toughness exhibit a tough-to-brittle transition with decreasing temperature - this transition being related to a change in fracture mode from ductile, dimple to cleavage-like. Finally, although the overaged 17-4 PH casting had a relatively low room temperature Charpy impact energy when compared to wrought 17-4 PH, its fracture toughness was at least comparable to that of wrought 17-4 PH. This observation suggests that prior correlations between Charpy impact energies and fracture toughness, as derived from wrought materials, must be approached with caution when applied to cast alloys.

15829 **(UCRL—84412) Testing of aluminum stainless steel bonds for long-term storage.** Colmenares, C.; Forehand, R.; Kirkwood, W.; Magistad, J. (Lawrence Livermore National Lab., CA (USA); J. G. M. Associates, Palo Alto, CA (USA)). Feb 1981. 21p. (CONF-801074—4). NTIS, PC A02/MF A01.

From 8. annual DOE compatibility meeting; Los Alamos, NM, USA (14 Oct 1980).

At the 19th Meeting of JOWOG-12 experiments designed to test the compatibility and aging trends of aluminum-stainless steel bonds manufactured by three different techniques (silver brazed, explosive bonded and friction bonded) were described. The significant results obtained after 492 days of testing at 50°, 70°, and 90°C and 462 days of testing under cycle temperature conditions between -30° and +70°C are presented. Bond ultimate strength values have been fitted to a model to predict lifetime estimates for each of the bonds studied. Elemental depth profiles of the surfaces of fractured specimens, aged under cyclic conditions for 328 days, were obtained using argon ion sputtering and Auger Electron Spectroscopy. These studies showed where fracture occurred in specimens pulled for mechanical testing.

15830 **(NE-M—8-1T(Rev.)(1-81)) Helical age-hardenable nickel-chromium-iron alloy springs.** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Jan 1981. 15p. Nuclear Standards Management Center, Oak Ridge, TN.

This standard covers the design, fabrication, and testing requirements for helical springs manufactured from age-hardenable nickel-chromium-iron alloy for use at temperatures up to 1200°F (649°C).

15831 **(NE-M—4-3T(Rev.)(1-81)) Cobalt-chromium alloy castings.** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Jan 1981. 10p. Nuclear Standards Management Center, Oak Ridge, TN.

This standard covers wear and corrosion resistant cobalt-chromium alloys in the form of sand, shale, investment, and centrifugal castings for nuclear and associated applications.

15832 **Attack polish for nickel-base alloys and stainless steels.** (to Dept. of Energy). US Patent Application 154,171. 28 May 1980. 9p.

A chemical attack polish and polishing procedure for use on metal surfaces such as nickel base alloys and stainless steels is described. The chemical attack polich comprises $FeNO_3$, concentrated CH_3COOH, concentrated H_2SO_4 and H_2O. The polishing procedure includes saturating a polishing cloth with the chemical attack polish and submicron abrasive particles and buffing the metal surface.

15833 **Overlapping double etch technique for evaluation of metallic alloys to stress corrosion cracking.** (to Dept. of Energy). US Patent Application 154,172. 28 May 1980. 9p.

A double overlapping etch zone technique for evaluation of the resistance of metallic alloys to stress corrosion cracking is described. The technique involves evaluating the metallic alloy along the line of demarcation between an overlapping double etch zone and single etch zone formed on the metallic alloy surface.

15834 **Method for fabricating uranium alloy articles without shape memory effects.** Banker, J.G. (to Dept. of Energy). US Patent Application 151,849. 21 May 1980. 9p.

Uranium-rich niobium and niobium-zirconium alloys possess a characteristic known as shape memory effect wherein shaped articles of these alloys recover their original shape when heated. The present invention circumvents this memory behavior by forming the alloys into the desired configuration at elevated temperatures with cold matched dies and maintaining the shaped articles between the dies until the articles cool to ambient temperature.

15835 **Amorphous metal alloy.** Wang, R.; Merz, M.D. (to Dept. of Energy). US Patent Application 138,951. 9 Apr 1980. 14p.

Amorphous metal alloys of the iron-chromium and nickel-chromium type have excellent corrosion resistance and high temperature stability and are suitable for use as a protective coating on less corrosion resistant substrates. The alloys are stabilized in the amorphous state by one or more elements of titanium, zirconium, hafnium, niobium, tantalum, molybdenum, and tungsten. The alloy is preferably prepared by sputter deposition.

15836 **Method for heat treating iron-nickel-chromium alloy.** (to Dept. of Energy). US Patent Application 137,049. 3 Apr 1980. 12p.

A method is described for heat treating an age-hardenable iron-nickel-chromium alloy to obtain a morphology of the gamma-double prime phase enveloping the gamma-prime, the alloy consisting essentially of about 25 to 45% nickel, 10 to 16% chromium, 1.5 to 3% of an element selected from the group consisting of molybdenum and niobium, about 2% titanium, about 3% aluminum, and the remainder substantially all iron. To obtain optimum results, the alloy is heated to a temperature of 1025 to 1075°C for 2 to 5 minutes, cold-worked about 20 to 60%, aged at a temperature of about 775°C for 8 hours followed by an air-cool, and then heated to a temperature in the range of 650 to 700°C for 2 hours followed by an air-cool.

15837 **Materials and corrosion programs sponsored by the US Department of Energy.** Ianniello, L.C. (Dept. of Energy, Washington, DC). pp 17.1-17.5 of Materials and corrosion problems in energy systems. Lochmann, W.J.; Indig, M. (eds.). Houston, TX; National Association of Corrosion Engineers (1980).

From Energy-sources technology conference; New Orleans, LA, USA (3 Feb 1980).

Materials research activities are sponsored by the Department of Energy (DOE) as part of its function to assist in the development of new energy technologies and more efficient use of existing ones. Materials problems and opportunities are an integral and often pace setting part of these research and development activities. Additionally, corrosion of materials is becoming increasingly recognized as both an avoidable cause of inefficiency and a severe problem to overcome in many advanced energy concepts. Hence, a great deal of attention is being focused on materials and corrosion research within the Department. In Fiscal Year 1979 the DOE sponsored materials research and development in twenty-five technological programs at a total funding level of 370 million dollars.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 15195, 15353, 15356, 15357, 15759, 15782, 15803, 15816, 15963

15838 **(CONF-810231—1) Hydrogen and chlorine detection at the SiO_2/Si interface.** Tsong, I.S.T.; Monkowski, M.D.; Monkowski, J.R.; Wintenberg, A.L.; Miller, P.D.; Moak, C.D. (Pennsylvania State Univ., University Park (USA); Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01.

From 5. international conference on ion beam analysis; Sydney, Australia (16 Feb 1981).

Hydrogen and chlorine depth profiles were obtained on a series of silicon oxides thermally grown in HCl/O_2 and Cl_2/O_2 ambients at 1100°C for 15 minutes using the ^{19}F nuclear reaction and SIMS techniques. The data show close correlation between the H and Cl profiles in both the HCl/O_2 and Cl_2/O_2 oxides. While the H and Cl appear to be enriched at the SiO_2/Si interface of the HCl/O_2 oxides, they are higher in concentration and more evenly distributed in the oxide bulk of the Cl_2/O_2 oxides.

15839 **(COO—2713-5) Effects of internal gas pressure and microstructure on the mechanisms of hot-pressing and swelling in ceramics. Final report, June 1, 1979-May 31, 1980.** Solomon, A.A. (Purdue Univ., Lafayette, IN (USA)). Aug 1980. 12p. NTIS, PC A02/MF A01.

The results of the study of the effects of internal and external gas pressures on ceramics are summarized. The new experimental systems for studying these phenomena are described. The study has shown that the rate of volume change in ZnO is linearly related to the total pressure driving force. Swelling and hot-pressing can be described on a consistent basis in terms of this driving force. For ZnO, Ni and UO_2 the rate of volume change is dependent on bulk diffusion. The porosity evolution during swelling is described and the resintering phenomenon is identified. Various models for pore growth and shrinkage are considered and related to the behavior of the different systems.

15840 **(LBL—12190) Influence of grain boundary silica impurity on alumina toughness.** Moya, J.S.; Kriven, W.M.; Pask, J.A. (Instituto de Ceramica y Vidrio, Madrid (Spain); Lawrence Berkeley Lab., CA (USA)). Aug 1980. Contract W-7405-ENG-48. 8p. (CONF-800765—5). NTIS, PC A02/MF A01.

From 7. LLR/MMRD international symposium of interfaces in glass-metal systems; Berkeley, CA, USA (28 Jul 1980).

In a series of previous reports the effect of silica impurity on aggregation state and on electropheretic, pressing, filtering and sintering behavior on alumina powders was presented. The results obtained showed that the silica surface impurity plays an important role in the ceramic processing of powders by (a) decreasing the pH values of the isoelectric point (i.e.p.), which affects the aggregation state of the powder, and (b) decreasing the compactability and the activation energy for the initial stage of sintering. In the phase of the studies emphasis was given to the effect of the presence of silica impurity on the toughness and fracture behavior of alumina samples.

15841 **(Y—2201) Materials for high-temperature hydrogen fluorine environments. Final report, June 1976-December 1978.** Holcombe, C.E. Jr.; Kovach, L. (Oak Ridge Y-12 Plant, TN (USA)). Mar 1981. Contract W-7405-ENG-26. 173p. NTIS, PC A08/MF A01.

A determination has been made of the stability of 35 materials under high-temperature, fluorine rich, hydrogen fluoride torch testing. Refractory materials tested included 4 borides, 3 carbides, 3 nitrides, 12 oxides, 1 oxynitride, 1 sulfide, 10 metals, and carbon (10 types). Three materials distinctly performed better than nickel: lanthanum hexaboride, calcium hexaboride, and lanthanum silicon oxynitride. Of these, lanthanum hexaboride is the best candidate tested since it has an estimated upper use temperature > 1726 K, which is above the melting point and more than 300 K above the upper use temperature of nickel.

3603 Composite Materials

REFER ALSO TO CITATION(S) 15543, 15543

15842 **(COO—444-9) Diffusion mechanisms and degradation of environmentally sensitive composite materials. Progress report, July 1, 1980-June 30, 1981.** Broutman, L.J. (Illinois Inst. of Tech., Chicago (USA)). 1 Mar 1981. Contract AS02-77ER04440. 32p. NTIS, PC A03/MF A01.

Moisture diffusion has been studied in both epoxy resins and glass and graphite fiber composites. A fixture has been perfected for maintaining a constant stress on a specimen during the diffusion experiment. Experiments on epoxy resins have been conducted at 4 different temperatures at zero stress and at 2400 psi stress. For temperatures less than 90°C, non-Fickian diffusion occurs. Several existing models to explain the diffusion behavior have been utilized to no avail. It has been discovered that diffusion curves for various thickness samples will superimpose at high sorption levels if plotted vs time/sup 1/2/ thickness /sup 1/2/. A model to account for this phenomena is being considered. In general the effect of stress is to increase both the moisture uptake rate and the equilibrium weight gain, and as a result the calculated diffusivity is nearly unaltered. At 90°C, epoxy resin samples have exhibited creep strains of nearly 20% when subjected to 2400 psi stress, whereas the creep strain in air is only 7% at 100°C.

15843 **Corrosion of polymer-concrete composites in hydrochloric acid at elevated temperature.** Yeo, R.S.; Zeldin, A.N.; Kukacka, L.E.;. (Brookhaven National Lab., Upton, NY). Contract AC02-76CH0016. *Journal of Applied Polymer Science ;* **26**: No. 4, 1159-1165(Apr 1981).

A series of polymer-concrete (PC) materials were evaluated in 30% hydrochloric acid at 90°C. It was shown that a polymer aggregated with quartz sand is a potential candidate for use in coating or construction materials for hydrogen-chlorine energy storage systems. The results have shown that the corrosion rate of PC in this solution is a diffusion-controlled process. The major weight loss can be attributed to the presence of cement in the PC samples. The influence of the sand/cement ratio, and the crosslinking agent content on the corrosion of PC samples is also discussed.

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 15419

15844 (UCRL—82694(Rev.1)) Dynamic mechanical and thermal properties of seven polyurethane adhesives. Hoffman, D.M. (Lawrence Livermore National Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 24p. (CONF-810308—7). NTIS, PC A02/MF A01.

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Seven polyurethane adhesives have been developed at Lawrence Livermore National Laboratory (LLNL). These adhesives, designated Halthanes were synthesized because of OSHA restrictions on the use of the curing agent methylene bis(2-chloroaniline). Four of the Halthanes were made from LLNL-developed 4,4'-methylene bis(phenylisocyanate) terminated prepolymers cured with a blend of polyols; three were made from an LLNL-developed prepolymer terminated with Hylene W and cured with aromatic diamines. In this paper the dynamic mechanical and thermal behavior of these seven segmented polyurethanes are discussed. The chemical structure of the hard and soft segments, the concentrations of each block, and the presence of tetrafunctional crosslinker determined the dynamic mechanical and thermal properties of the three types of polyurethane adhesives, 73-, 87-, and 88-series Halthanes studied. Aromatic-aliphatic MDI- butanediol urethane hard segments produce lower modulus (10^6 Pa) materials in the rubbery region than cyclic unsaturated-aromatic urea hard segments. Incorporation of chemical crosslinks in the hard segments extended the rubbery plateau beyond the hard segment transitions up to temperatures where the polymer begins to degrade. Concentration of hard and soft segments can also be used to control the modulus between the glass transition temperatures of the two blocks.

15845 Measurement of kinetics of solid-solid phase transformation by pulse NMR. Fury, M.; Huang, S.G.; Jonas, J. (Univ. of Illinois, Urbana). Contract EY-76-C-02-1198. *Journal of Magnetic Resonance ;* **33**: 211-214(1979).

The pulse NMR technique has been used to determine the phase diagrams of plastic crystals. The abrupt changes in T_1 or T_2 at the phase transition provide the means of detecting the precise phase-transition pressure. An NMR relaxation study of the kinetics of the plastic phase transition in adamantane is reported here. The high-pressure phase transition of adamantane has been shown to be structurally analogous to the low-temperature transition at one bar. The use of pressure as an experimental variable allows one to bring the sample rapidly to a nonequilibrium state to drive the phase transition towards completion. At the phase-transition pressure, the T_1 of adamantane decreases abruptly by a factor of about 40 in passing from the plastic (α) phase to the brittle (β) phase. 2 figures. (RWR)

3606 Other Materials

REFER ALSO TO CITATION(S) 15237, 15443, 15446, 15446, 15446, 15447, 15451, 15452, 15457, 15458, 15460, 15460, 15461, 15462, 15462, 15463, 15463, 15464, 15464, 15467, 16285, 16286, 16288

15846 (AD-A—084199) Preparation and photoelectronic properties of the system Cd_2Ge/sub 1-x/Si/sub x/O_4. Technical report. Nguyen, V.S.; Kershaw, R.; Dwight, K.; Wold, A. (Brown Univ., Providence, RI (USA). Dept. of Chemistry). May 1980. Contract N00014-77-C-0387. 24p. NTIS, PC A02/MF A01.

Members of the system Cd_2Ge/sub 1-x/Si/sub x/O_4 where $0 \leqq x \leqq 0.4$ have been prepared. These compounds were observed to crystallize with the olivine structure, space group Pbnm. The resistivity, Hall mobility, flat-band potential, band gaps, and stability were determined as functions of composition. The variation of these photoelectronic properties can be attributed to the reduction of the cell parameters with increasing silicon substitution. The resulting increase in stability is dramatic.

15847 (CONF-800402—19) ^{166}Er Moessbauer and x-ray diffraction study of $ErMn_2$ hydrides. Viccaro, P.J.; Shenoy, G.K.; Niarchos, D.; Dunlap, B.D. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 17p. NTIS, PC A02/MF A01.

From International symposium on the properties and applications of metal hydrides; Colorado Springs, CO, USA (7 Apr 1980).

The pressure-composition isotherm at 22°C for $ErMn_2H$/sub x/ between 1 and 10^4 torr shows the formation of two hydride phases with composition $x = 4.6$ and $x = 4.0$, and with equilibrium H_2 pressures of 15 torr and less than 1 torr, respectively. Both hydrides are expanded versions of the C14 hexagonal Laves structure of $ErMn_2$ with volume expansions of 23% and 37% for the lower and higher order phases, respectively. A slight preferential expansion parallel to the C_0 axis is observed. The ^{166}Er Moessbauer results show that Er magnetic moment in both hydride phases is reduced from the free-ion value measured in $ErMn_2$. The ferromagnetic ordering present in $ErMn_2$ and $ErMn_2H_4$ is absent in $ErMn_2H_{4.6}$ down to 1.5 K. Two Er sites are detected in $ErMn_2H_4$ instead of one expected for the C14 structure. The origin of these sites is discussed in terms of possible hydrogen site occupancy configurations.

15848 (SAND—81-0568C) Pulsed uv laser Raman spectroscopy of silane in a linear flow CVD reactor. Breiland, W.G.; Kushner, M.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 3p. (CONF-810516—1). NTIS, PC A02/MF A01.

From 4. international symposium on silicon materials science and technology; Minneapolis, MN, USA (10 May 1981).

Gas-phase silane density profiles were inside a linear flow CVD reactor during the silicon deposition process using pulsed uv laser Raman spectroscopy. The profiles distinctly show that a substantial amount of silane is depleted from the gas phase for vertical distances up to 1 cm above the heated susceptor. Gas-phase particulate formation is observed under all deposition conditions, but a gap several millimeters high exists directly above the susceptor in which no particulates are observed.

40 CHEMISTRY

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 15230, 15231, 15274, 15345, 15346, 15347, 15348, 15352, 15364, 15409, 15411, 16284

15849 Determination of submicromolar amounts of uranium(VI) by complexometric titration with pyridine-2,6-dicarboxylic acid. Marsh, S.F.; Betts, M.R.; Rein, J.E. (Los Alamos Scientific Lab., NM (USA)). *Analytica Chimica Acta ;* **119**: No. 2, 401-404(1 Oct 1980).

Uranium(VI) is selectively determined by a complexometric titration with pyridine-2,6-dicarboxylic acid, using arsenazo-I indicator and hexamethylenetetramine buffer at pH 4.9. Cyclohexanediaminetetraacetic acid and diethylenetriaminepentaacetic acid provide masking of interfering metal ions. A probe colorimeter apparatus is recommended for endpoint detection. The relative standard deviation is 0.6% for 0.17-0.76 μmol of uranium.

15850 (FE—2433-26) Environmental assessment of the HYGAS process. Volume III. Interim report on HYGAS environmental characterization: manual of methods for characterization of HYGAS pilot plant solids, liquids, and gases. Karst, R.H.; Passaniti, J.L.; Metcalf, T.C.; Salazar, E.V.; Pau, J.C. (Institute of Gas Technology, Chicago, IL (USA)). Nov 1980. Contract AC01-76ET10261. 126p. NTIS, PC A07/MF A01.

The US Department of Energy (DOE) has commissioned the HYGAS environmental assessment program to characterize various solid, liquid, and gaseous streams in the HYGAS pilot plant. The purpose of this manual is to describe the various analytical techniques that have been used to analyze pilot plant streams for environmental species. Many of the techniques have been rec-

ommended by the US Environmental Protection Agency or otherwise have been published in ASTM Standards, Standard Methods, and assorted vendor equipment manuals. Complete references have been provided in the text. Analytical techniques for the determination of the following are included: ammonia-nitrogen; biochemical oxygen demand; chemical oxygen demand; chlorides; total cyanide; grease and oil; total organic carbon; phenol; total, suspended, and dissolved solids; sulfide; total sulfur; thiocyanate; total oxygen demand; hydrocyanic acid in gas; hydrogen sulfide in gas; gaseous hydrocarbons; organic compounds in HYGAS light oil and aqueous samples; proximate analysis of coal; ultimate analysis of coal; calorific value; screen analysis; bulk density; and trace elements in coal (arsenic, antimony, selenium, tellurium, barium, beryllium chromium, copper, iron, lithium, manganese, nickel, tin, vanadium, zinc, boron, cadmium, lead, thallium, chlorine, cobalt, fluorine, mercury, and molybdenum). (DMC)

15851 **(IS-T—916) Ion chromatography with low-capacity resins and low-conductivity eluents.** Gjerde, D.T. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 171p. NTIS, PC A08/MF A01.

Thesis.

Strong-base anion exchangers with capacities ranging from 0.04 to 1.46 mequiv./g and from 0.0016 to 0.024 mequiv./g are prepared from Amberlite XAD resins. Distribution ratios of common inorganic and organic anions decrease with decreasing resin capacity, but selectivity coefficients are essentially constant for most of the anions studied. The effect of resin capacity on the distribution ratios for some of the metals that form anionic chloro complexes is also studied. The low-capacity resins are shown to be useful for practical chromatographic separations of mixtures containing palladium(II), platinum(IV), gold(III), bismuth(III) and mercury(II). A new and simple system of anion chromatography is described for the separation and determination of inorganic and organic anions. The anions are separated on a column containing a macroporous anion-exchange resin of a low capacity (0.0007 to 0.07 mequiv./g). Only a dilute solution of an aromatic organic acid salt is needed as the eluent. The eluent conductance is sufficiently low so that a suppressor column is not needed and the separated anions can be detected with a simple conductance detector. Numerous examples of actual separations are shown. In some cases, concentrations of anions below 1 ppM could be detected. Equations are developed to help separate difficult mixtures of anions. A system of cation chromatography is described in which metal and ammonium ions are separated on a cation-exchange column of low capacity and are detected with a conductivity detector. No suppressor column is needed. A nitric acid eluent is used to separate mixtures of alkali metal and ammonium ions, and an eluent containing an ethylenediammonium salt is used for the separation of alkaline earth metal ions. The new method is used to determine sodium, potassium, ammonium, magnesium and calcium in drinking water.

15852 **(IS-T—938) Chemically based models to predict distribution coefficients in the copper (II) and zinc (II) chloride-tri-n-octylamine extraction systems.** Elhassadi, A. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 128p. NTIS, PC A07/MF A01.

Thesis.

The fundamental chemistry of copper (III) and zinc (II) chloride extraction by the extractant tri-n-octylamine is reviewed. The chemically based model is derived for both the single systems and the binary system. The predictive model makes use of the aqueous phase metal chloride complexes' stability constants, their extraction mechanism, and the equilibrium constant for the extraction reaction. The distribution coefficient of copper and zinc can be predicted by the equation $D = K_1\alpha_0 phi^3$, where phi is the product of the equilibrated organic concentration and the chloride ion concentration in the aqueous phase, K_1, is the effective equilibrium constant containing the quotient of the activity coefficients of the reacting species and α_0 is the degree of formation of the free metal ion in the equilibrated aqueous phase. Excellent agreement between the experimental data and the predicted values was obtained. The multicomponent, binary metal extraction is examined in a quantitative manner. The separation factor can be predicted by the equation S/sub M,N/ = $K_1'[(\alpha_0)M/(\alpha_0)N]$. This model was based on the assumption that the activity coefficient varies slightly with its concentration. The experimental results show that the data fit the binary model very well. The suppression of copper extraction in the presence of zinc was noticed.

15853 **(PNL-SA—8912) Characterization of low activities by mass spectrometry.** Lagergren, C.R. (Battelle Pacific Northwest Labs., Richland, WA (USA)). 11 Nov 1980. Contract AC06-76RL01830. 8p. (CONF-801186—1). NTIS, PC A02/MF A01.

From International conference on low-level activity measurement: low activities; Strbske Pleso, Czechoslovakia (24 Nov 1980).

Surface ionization mass spectrometry has been successfully applied to the measurement of plutonium in the environment. Since ionization efficiencies as high as one percent are achievable, detection limits for plutonium are possible which are lower than those attainable radiometrically. In addition the relative amounts of ^{239}Pu and ^{240}Pu can be determined. This capability is the result of development efforts in three areas: (1) mass spectrometer instrumentation; (2) filament treatment procedures; and (3) sample processing procedures. Measurements on plutonium samples collected from the environment have been made in which the abundance of a minor isotope was determined at a 10% relative error when 10^{-16}g of that isotope was present in the original sample. This amounts to determining the isotopic composition (except for ^{238}Pu) on samples having $^{239}Pu + {}^{240}Pu$ activity levels of 0.003 disintegrations per minute.

15854 **Inductively coupled argon plasma as an ion source for mass spectrometric determination of trace elements.** Houk, R.S. (Iowa State Univ., Ames); Fassel, V.A.; Flesch, G.D.; Svec, H.J.; Gray, A.L.; Taylor, C.E. Contract W-7405-ENG-82. *Analytical Chemistry ;* **52**: No. 14, 2283-2289(Dec 1980).

Solution aerosols are injected into an inductively coupled argon plasma (ICP) to generate a relativly high number density of positive ions derived from elemental constituents. A small fraction of these ions is extracted through a sampling orifice into a differentially pumped vacuum system housing an ion lens and quadrupole mass spectrometer. The positive ion mass spectrum obtained during nebulization of a typical solvent (1% HNO_3 in H_2O) consists mainly of ArH^+, Ar^+, H_3O^+, H_2O^+, NO^+, O_2^+, HO^+, Ar_2^+, Ar_2H^+, and Ar^{2+}. The mass spectra of the trace elements studied consist principally of singly charged monatomic (M^+) or oxide (MO^+) ions in the correct relative isotopic abundances. Analytical calibration curves obtained in an integration mode show a working range covering nearly 4 orders of magnitude with detection limits of 0.002 to 0.06 μg/mL for those elements studied. This approach offers a direct means of performing trace elemental and isotopic determinations on solutions by mass spectrometry.

15855 **Liquid-liquid extraction separation and determination of plutonium and americium.** Bernabee, R.P.; Percival, D.R.; Hindman, F.D. (Dept. of Energy, Idaho Falls, ID). *Analytical Chemistry ;* **52**: No. 14, 2351-2353(Dec 1980).

A procedure is described for the determination of plutonium and americium after their initial separation on barium sulfate. The barium sulfate is dissolved in perchloric acid and the antinides and lanthanides are extracted into bis(2-ethylhexyl)phosphoric acid (HDEHP). Americium along with other tervalent actinides and lanthanides is stripped from HDEHP with nitric acid. The lanthanides are removed on a column of HDEHP supported on Teflon powder, and the americium and other tervalent actinides are electrodeposited for their determination by α spectrometry. The plutonium is stripped with nitric acid after reduction to the tervalent state with 2,5-di-tert-butylhydroquinone and electrodeposited for α spectrometry. Decontamination factors for plutonium and americium from each other and from other α emitters are 10^4 to 10^5. Two hours are required for the liquid-liquid extraction separations of plutonium and americium from eight samples. Recoveries of americium and plutonium through the HDEHP separatons are 99% and 95%, respectively.

15856 **Interfacial activity of liquid/liquid extraction reagents. 3. Crown ethers.** Vandergrift, G.F.; Delphin, W.H. (Argonne National Lab., IL (USA)). *Journal of Inorganic and Nuclear Chemistry ;* **42**: No. 9, 1359-1361(1980).

15857 Thin film characterization using analytical electron microscopy. Zaluzec, N.J. (Argonne National Lab., IL). *Thin Solid Films ;* **72**: 177-192(1980).

In order to understand the properties of solids, the materials scientist frequently needs to characterize the microstructure of a material on as fine a scale as possible. Characterization here is used in its most general sense, i.e. to describe as completely as possible the morphology, crystallography and elemental composition of the material under investigation. Although instruments have been developed over the years that can provide this information, they generally have one common limitation, namely spatial resolution. Analytical electron microscopy (AEM) is the term which is now applied to a new group of analytical techniques used in conjunction with a transmission electron microscope and/or a scaning-transmission electron microscope that can provide high spatial resolution (about 20 nm) analyses from microvolumes of material in thin electron-transparent specimens. The basic principles of microanalysis using AEM are discussed, together with examples of application in both metallurgical and ceramic studies.

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 15903, 15909, 15911, 16291

15858 (AD-A—084243) Quantum dynamics of chemical reactions. Final report 1 Jun 77-30 Jun 79. Kuppermann, A. (California Inst. of Tech., Pasadena (USA). Div. of Chemistry and Chemical Engineering). 14 Mar 1980. 22p. NTIS, PC A02/MF A01.

The purpose of this project was to perform accurate and approximate quantum dynamical calculations on elementary chemical reactions of importance for the fundamental aspects of chemical dynamics and for advanced technologies, such as high energy chemical lasers, plume technology, and the chemical effects of high energy radiation. These included calculations of three-atom exchange reactions, breakup collisions, three-body recombinations, vibrational quenching by reaction, tunneling, and electronic branching ratios. The aim of these calculations was to develop an understanding of these processes and to develop benchmark data against which approximate methods may be tested.

15859 (AD-A—084255) Crossed molecular beam study of the reactions of oxygen and fluorine atoms. Annual report Jan 79-Feb 80. Lee, Y.T. (California Univ., Berkeley (USA). Dept. of Chemistry). 1 Mar 1980. Contract N00014-75-C-0671. 36p. NTIS, PC A03/MF A01.

Rapid developments in the study of oxygen reaction chemistry occurred as it is succeeded in obtaining an O(1D) beam source and commenced investigating the dynamics of several important reactions of O(3P) and O(1D). In the reaction of O(3P) with C6H6 and C6D6, two competing channels, one producing a stabilized addition complex and the other forming radical products C6H50 + H has been identified. Studies of the effects of collision energy and of deuteration were used to clarify the reaction mechanism. The reaction of O(3P) with another aromatic hydrocarbon toluene, results in competition between two substitution channels, loss of H atom and loss of CH3. In contrast to the 0 + C6H6 reaction, no stabilized oxygen-toluene adduct was observed.

15860 (CONF-8004148—1) Spectrophotometric studies of holmium(III) chloride-aluminum(III) chloride vapor complexes. Williams, C.W.; Hessler, J.P.; Peterson, E.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01.

From 7. annual meeting of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers; Washington, DC, USA (30 Apr 1980).

The gas complexation reactions between $LnCl_3$ and Al_2Cl_6 to yield molecular species of the form $LnCl_3$ (Al_2Cl_6)/sub x/ have been studied for a number of years. The spectrophotometric technique has been used to deduce the thermodynamic properties of the molecular species. We have studied the $HoCl_3$ (Al_2Cl_6)/sub x/ system from 600 to 900°K and at Al_2Cl_6 pressures between 1 and 7 atm. The Ho^{3+} hypersensitive transition between $^5I_8$ and $^5G_6$ at 456 nm has been used to measure the complex vapor densities as a function of pressure and temperature. A temperature-dependence of the optical absorption spectrum was observed in samples with a constant Ho^{3+} ion density. These data cannot be understood in terms of the generally used treatment of molar absorptivity, but requires the introduction of an effective oscillator strength. A temperature-dependent oscillator effect is also observed and this is interpeted as evidence for the presence of multiple species with differing oscillator strengths. The consequence of these observations for the determination of equilibrium constants for the different species will be discussed.

15861 (COO—4220-4) Chemical diffusion on solid surfaces. Final report. Hudson, J.B. (Rensselaer Polytechnic Inst., Troy, NY (USA)). Dec 1980. Contract AS02-77ER04220. 10p. NTIS, PC A02/MF A01.

The techniques of surface science have been applied to the problem of the measurement of the surface diffusion rate of an adsorbed species over the surface of a chemically dissimilar material. Studies were carried out for hydrogen and nitrogen adatoms on a Ni(100) surface and for silver adatoms on a sapphire surface. Positive results were obtained only for the case of nitrogen on Ni(100). In this system the diffusivity is characterized by the expression D = D_0 exp (/sup -ΔH//RT), with D_0 = 0.25 cm^2/sec and ΔH = 28kcal/mol.

15862 Heat capacity (5 to 350°K) and recommended thermodynamic properties of barium uranate ($BaUO_4$) to 1100°K. O'Hare, P.A.G.; Flotow, H.E.; Hoekstra, H.R. (Argonne National Lab., IL (USA)). *Journal of Chemical Thermodynamics, The ;* **12**: No. 10, 1003-1008(Oct 1980).

Adiabatic calorimetry was used to determine the low-temperature heat capacity of $BaUO_4$ from 5 to 350 K. No anomalous behavior was observed, the curve of heat capacity against temperature being of the normal sigmoid shape. From these measurements, the following thermodynamic properties (298.15 K) were obtained: C^0sub(p) = (125.27 +- 0.25) J K^{-1} mol^{-1}; S^0 = (153.97 +- 0.31) J K^{-1} mol^{-1}; ($H^0(T) - H^0(0)$) = (23291 +- 47) J mol^{-1}; ($G^0(T) - H^0(0)$)/T = -(75.85 +- 0.15) J K^{-1} mol^{-1}. Published high-temperature enthalpy increments merge smoothly with the present low-temperature results. An earlier result for the enthalpy of formation, ΔH^0sub(f)(298.15 K), has been recalculated to be -(1997.1 +- 2.1) kJ mol^{-1}. Recommended thermodynamic quantities for $BaUO_4$ have been calculated and are listed at selected temperatures up to 1100 K.

15863 (IS-T—913) Synthesis and reactivity of iron carbene complexes. McCormick, F.B. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 195p. NTIS, PC A09/MF A01.

Thesis.

In an effort to more fully understand the chemistry of carbene complexes, two series of complexes, $Cp(CO)_2Fe$- $[C(XR)YR]^+$ and Cp(CO) (L) $Fe[C(SCH_3)_2]^+$ where X and Y are O, S, Se, and/or NR and L is CH_3NC, $P(OPh)_3$, $P(OCH_3)_3$, PPh_3, $AsPh_3$, $SbPh_3$, C_5H_5N, or CH_3CN, were prepared, and their reactivity towards nucleophilic reagents, especially amines was studied. The purpose was to correlate the reactivity patterns of these complexes with the electronic environment of the carbene carbon. Techniques for probing the electronic environment of the carbene carbon were IR, ^{1}H-NMR, and ^{13}C-MNR spectroscopy. The dissertation is composed of the following five sections: (I) synthesis of cyclopentadienyldicarbonyl[dithiocarbene] iron cations and their reactions with amines; (II) preparation of eta^5-cyclopentadienyldicarbonyltri (organo-thio) methyliron complexes and the structure of eta^5-cyclopentadienyldicarbonyltri (methylthio)-methyliron; (III) synthesis and spectroscopic study of eta^5-$C_5H_5(CO)_2Fe[C(XR)YR]^+$ carbene complexes, where X and Y are O, S, Se, and/or NR; (IV) reactions eta^5-$C_5H_5(CO)_2Fe[C(XR)YR]^+$ carbene complexes, where X and Y are O, S, Se, and/or NR, with amines; (V) synthesis, reactivity, and spectroscopic studies of eta^5-$C_5H_5(CO)$ (L) Fe-$[C(SCH_3)_2]^+$ carbene complexes. Each section has an introduction, experimental section, results and discussion section and references.

15864 (IS-T—917) Proton NMR of $H_{1\ 7}Mo0_3$ and $YH_{1\ 92}$. Taylor, R.E. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 95p. NTIS, PC A05/MF A01.

Thesis.

Nuclear magnetic resonance (NMR) spectroscopy has been used since its inception to study chemical systems in the solid state. In general, these studies have dealt with measurements of relaxation times or interpretations of the NMR absorption spectrum in terms of the largest interaction present. However, the use of recently developed NMR techniques allows the separation and characterization of the interactions present. The work reported in this dissertation deals with the application of existng proton NMR techniques as well as the extension of high resolution techniques and their use to learn more about the nature and mobility of protons in $H_{1\ 7}MoO_3$ and $YH_{1\ 92}$.

15865 (IS-T—945) Synthesis and reactivity of some tungsten carbene complexes. Pickering, R.A. (Ames Lab., IA (USA)). Feb 1981. Contract W-7405-ENG-82. 125p. NTIS, PC A06/MF A01.

Thesis submitted to Iowa State Univ.

Dithiocarbene tungsten complexes, $W(CO)_5[C(SR)(SR')]$, were prepared in good yield. The substituted tetracarbonyl dimethyldithiocarbene tungsten complexes are prepared by an analogous route. Cyclic dithiocarbene tungsten complexes may be prepared in a similar manner. Isocyanide complexes are formed when $W(CO)_5[C(SCH_3)_2]$ reacts with primary amines. Net effect of the reaction of tungsten dithiocarbene complexes with tertiary phosphine is to transfer the carbene group from the tungsten to the phosphorus atom.

15866 Generation of CO_2 pulses by free induction decay in KCl:$KReO_4$. Ahrenkiel, R.K. (Los Alamos Scientific Lab., NM); Dunlavy, D.; Sievers, A.J. *Optics Communications ;* **32**: No. 3, 503-506(Mar 1980).

Subnanosecond pulses have been produced by optical free induction decay in KCl:$KReO_4$. Here the ν_3 vibrational mode of the perrhenate ion (REO_4^-) acts as a resonant absorber for the 10.6 μm, P(26) CO_2 laser line. As the phase relaxation time T_2 of the substitutional molecule ion is very small, efficient picosecond pulses can be produced by this medium if faster shuttering can be devised.

15867 (K/OA—4728) Monte Carlo simulation of isotope separation in opposed jets. Anderson, J.B.; Malling, G.F. (Pennsylvania State Univ., University Park (USA). Dept. of Chemistry; Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.). 30 Mar 1981. Contract W-7405-ENG-26. 14p. (CONF-800715—5). NTIS, PC A02/MF A01.

From 12. international symposium on rarefied gas dynamics; Charlottesville, VA, USA (7 Jul 1980).

The separation of isotopes in opposed jet flows from slits was examined in Monte Carlo simulations of these flows at several density levels. The basic Monte Carlo method of Bird was employed to determine the flow fields and provide preliminary estimates of separation factors. Separation factors of high accuracy were obtained using a test-particle method in which single particles were followed through the flow fields established by the Bird method. Results were obtained for the system $^4He/^{36}Ar$, ^{40}Ar, with the argon isotopes seeded at low mole fraction into the helium carrier gas. Species densities, velocities and velocity distributions, as well as separation factors, are reported. For mixtures of 10% Ar in He, the optimum separation effect is observed at inverse Knudsen numbers, based on slit widths, in the range of 10 to 20.

15868 Strong metal-support interaction between mononuclear and polynuclear transition metal complexes and oxide supports which dramatically affects catalytic activity. Hucul, D.A.; Brenner, A. (Wayne State Univ., Detroit, MI). *Journal of Physical Chemistry, The ;* **85**: No. 5, 496-498(5 Mar 1981).

The interaction of carbonyl complexes with catalyst supports, primarily γ-alumina, has been studied by temperature-programmed decomposition. In all cases, including cluster complexes and complexes of noble metals, after heating to 600°C in flowing He the catalysts are significantly oxidized due to a redox reaction between surface hydroxyl groups and the initially zero-valent metal. Contrary reports are probably incorrect and likely reflect the insensitivity of the experimental techniques used. For all but the most thermally unstable complexes, the oxidation occurs during the latter stages of decarbonylation indicating that there is no significant accumulation of bare zero-valent metal. Hence, decomposition does not in general provide a direct route to supported metals and, contrary to some claims, molecular cluster complexes cannot necessarily be used as precursors to supported metal clusters. Further, knowledge of this redox reaction is critical for understanding patterns of activity and for the development of improved catalysts.

15869 Ion beam studies of the reactions of atomic cobalt ions with alkanes: determination of metal-hydrogen and metal-carbon bond energies and an examination of the mechanism by which transition metals cleave carbon-carbon bonds. Armentrout, P.B.; Beauchamp, J.L. (California Inst. of Tech., Pasadena). *Journal of The American Chemical Society ;* **103**: No. 4, 784-791(25 Feb 1981).

An ion beam apparatus is employed to study the reactions of singly charged cobalt positive ions with hydrogen and 17 alkanes. Reaction cross sections and product distributions as a function of kinetic energy are determined. Exothermic carbon-carbon bond cleavage reactions are observed for all alkanes but methane and ethane. A mechanism involving oxidative addition of C-C and C-H bonds to cobalt as a first step is demonstrated to account for all major reactions at all energies. Interpretation of several endothermic processes allows the extraction of thermochemical data. The bond dissociation energies obtained are $D^0(Co^+\text{-}H) = 52 +\text{-} 4$ kcal/mol, $D^0(Co\text{-}H) = 39 +\text{-} 6$ kcal/mol, $D^0(Co^+\text{-}CH_3) = 61 +\text{-} 4$ kcal/mol, and $D^0(Co\text{-}CH_3) = 41 +\text{-} 10$ kcal/mol.

15870 Formation of chromium carbene ions by reaction of electronically excited chromium ions with methane in the gas phase. Halle, L.F.; Armentrout, P.B.; Beauchamp, J.L. (California Inst. of Tech., Pasadena). *Journal of The American Chemical Society ;* **103**: No. 4, 962-963(25 Feb 1981).

Cr^+ ions formed by electron impact from $Cr(CO)_6$ reacts with methane to produce $CrCH_2^+$ in abundance, and the cross section-energy relation is exothermic. Lesser amounts of $CrCH_3^+$ and CrH^+ are also formed. Experiments confirm that an electronically excited state of Cr^{+7} is involved. (DLC)

15871 Crystal and molecular structure of the 1:2 charge-transfer salt of trimethyleneferrocene and 7,7,8,8-Tetracyano-p-quinodimethane: $[Fe(C_5H_4)_2(CH_2)_3^+.][(TCNQ)_2^-.]^1$. Willi, C. (Argonne National Lab., IL); Reis, A.H. Jr.; Gebert, E.; Miller, J.S. *Inorganic Chemistry ;* **20**: No. 2, 313-318(Feb 1981).

The charge-transfer reaction between trimethyleneferrocene ($Fc(CH_2)_3$) and 7,7,8,8-tetracyano-p-quinodimethane (TCNQ) results in a 1:2 salt of composition $[Fe(C_5H_4)_2(CH_2)_3^+.][(TCNQ)_2^-.]$. The crystal and molecular structures of this substance have been determined by single-crystal x-ray diffraction. The complex crystallizes as block plates in the centrosymmetric space group C2/c with the unit cell constants of a = 13.608 (1) A, b = 7.738 (1) A, c = 28.788 (3) A, β = 94.336 (8)°, V = 3022.66 A^3, and Z = 4. The structure was solved by a combination of direct methods, Fourier, and full-matrix least-squares refinement techniques. A final R/sub F/ = 0.049 was obtained for 2328 reflections where $F_o^2 > \sigma(F_o^2)$. The structure consists of segregated stacks of $[(TCNQ)_2^-.]$ dimers and trimethyleneferrocenium $[Fc(CH_2)_3^+.]$ ions, respectively. The stacking distance between the TCNQ/sup 1/2-/ planes of each dimer is 3.162 (5) A, while the distance between dimers is 3.423 (10) A. The $[(TCNQ)_2^-.]$ dimers form stacks which are inclined along the b axis, while the $[Fc(CH_2)_3^+.]$ ions are aligned along the a axis and rotated 45° about the b axis. The sterically hindering trimethylene bridge causes the C_5 planes of the $[Fe(CH_2)_3^+.]$ ion to be tilted at an angle of 13.7 (9)° with respect to each other. This amount is significantly greater than the ring tilt observed for other nonoxidized ferrocenes containing three-membered bridges. The bridging carbon atoms between the rings exhibit disorder. The bond distances of the exocyclic carbon-carbon bonds of the $[(TCNQ)_2^-.]$ ion are 1.390 (3) and 1.394 (4) A, which are consistent with a charge transfer of 0.5 e/TCNQ.

15872 X-ray crystallographic characterization of an adenine-cadmium (II) complex, di-μ-adeninium-di-μ-aquo-tetrakis(nitrato-0,0')dicadmium(II) dinitrate, containing a cationic nuclei acid base as a bidentate ligand. Wei, C.H.; Jacobson, K.B. (Oak Ridge National Lab., TN). Contract W-7405-ENG-36. *Inorganic Chemistry ;* **20**: No. 2, 356-363(Feb 1981).

The reaction of the monosodium salt of adenosine-5'-monophosphoric acid with cadmium nitrate in the presence of nitric acid has resulted in the formation of a binuclear cadmium complex of adenine, $[(C_5H_5N_5)Cd(NO_3)_2.H_2O]_2(NO_3)_2$. The crystal structure of this complex has been characterized by single-crystal x-ray analysis based on counter data collected with an automated diffractometer. The crystals contain one centrosymmetric dimer in a reduced triclinic cell of symmetry P anti 1 and of dimensions a = 7.595 (2) A, b = 9.539 (5) A, c = 10.527 (5) A, α = 101.37 (3)°, β = 108.69 (3)°, and γ = 107.42 (3)°.

15873 Pure- and mixed-crystal optical studies of the Jahn-Teller effect for the d^6 hexafluoroplatinate (IV) ion. Laurent, M.P.; Patterson, H.H.; Pike, H.; Engstrom, H. (Univ. of Maine, Orono). Contract EY-76-C-02-0016. *Inorganic Chemistry ;* **20**: No. 2, 372-375(Feb 1981).

Measurements have been made of the low-temperature luminescence and Raman spectra of pure Cs_2PtF_6 crystals and Cs_2PtF_6-Cs_2GeF_6 crystals in which PtF_6^{2-} is doped into the Cs_2SiF_6 lattice. In both environments, the Raman spectra at liquid-helium temperature show sharp lines assigned to the a/sub 1g/, e/sub g/, and t/sub 2g/ internal modes of the PtF_6^{2-} ion. A comparison of the low-temperature Raman and sharp-line luminescence spectra indicates that in the luminescence spectra a Jahn-Teller e/sub g/-type progression occurs with a small degree of anharmonicity present. The luminescence can be assigned as a transition from the t_2^5e/sub g/$\Gamma_3(^3T$/sub 1g/) twofold degenerate excited electronic state to the t/sub 2g/$^6\Gamma_1(^1A$/sub 1g/) nondegenerate ground electronic state.

15874 Properties of the oxo/aquo system $(bpy)_2(py)RuO^{2+}/(bpy)_2(py)Ru(OH_2)^{2+}$. Moyer, B.A.; Meyer, T.J. (Univ. of North Carolina, Chapel Hill). *Inorganic Chemistry ;* **20**: No. 2, 436-444(Feb 1981).

The complex $Ru(pby)_2(py)H_2O^{2+}$ (pby is 2,2'-bipyridine; py is pyridine) has been prepared and found to undergo two reversible one-electron oxidations both by electrochemical means and by redox titrations using Ce(IV). The one-electron oxidation product, $Ru(bpy)_2(py)H_2O^{3+}$, has strongly enchanced properties as an acid, pK/sub a/ = 0.85 +- 0.03 at 25.0°C, I = 1.0 M, compared to the Ru(II) complex, pK/sub a/ = 10.79 +- 0.01. The hydroxy complex, $Ru(bpy)_2(py)OH^{2+}$, has also been isolated and characterized as its perchlorate salt. The two-electron product, $Ru(bpy)_2(py)O^{2+}$, was shown to be a Ru(IV)-oxo complex by the results of a series of experiments including elemental analysis, solution conductivity, magnetism, and ^{18}O labeling. Given the acid-base properties of the complexes, redox potentials for the Ru(IV)/Ru(III) and Ru(III)/Ru(II) couples have the expected pH dependences, and at pH 7 the potentials are (vs. the SCE) $(bpy)_2(py)RuO^{2+}$ /sup 0.53 V/ $(bpy)_2(py)RuOH^{2+}$ /sup 0.42 V/ $(bpy)_2(py)RuOH_2^{2+}$. Our ability to isolate a stable Ru(IV)-oxo complex and the general redox characteristics of the system are discussed in the context of the oxidation of water, the reduction of oxygen, and the competitive formation of oxo-bridged dimers.

15875 Hydrolysis equilibrium of dinitrogen trioxide in dilute acid solution. Markovits, G.Y.; Schwartz, S.E.; Newman, L. (Brookhaven National Lab., Upton, NY). Contract AC02-76CH00016. *Inorganic Chemistry ;* **20**: No. 2, 445-450(Feb 1981).

Solutions of nitrous acid in dilute (0.1 M HCl) or more concentrated (~ 5 M $HClO_4$) acid exhibit a contribution to the ultraviolet absorbance that is quadratic in $[HNO_2]$. In dilute acid this excess absorbance is attributed to N_2O_3 formed through equilibrium $1,2HNO_2 = N_2O_3 + H_2O$. From the measured spectrum of ϵ/sub N_2O_3/K_1 vs. wavelength (245-260 nm) and by comparison with ϵ/sub N_2O_3/ obtained in pulse radiolysis by Graetzel et al., K_1 is determined as (3.03 +- 0.23) x $10^{-3}M^{-1}$ in agreement with the value calculated thermochemically. The coefficient of physical solubility of N_2O_3 in water is computed as 0.70 +- 0.05 M atm^{-1}. The extinction quadratic in $[HNO_2]$ is independent of acid concentration of dilute acid but increases strongly in more concentrated acid, suggesting a possible second absorbing species of stoichiometry $HN_2O_3^+$.

15876 Xα multiple-scattering study of hexacyanoferrate (III). Aizman, A.; Case, D.A. (Univ. of California, Davis). *Inorganic Chemistry ;* **20**: No. 2, 528-533(Feb 1981).

Molecular orbital calculations in the Xα multiple-scattering approximation are presented for the title ion. The effects of varying sphere overlap and of including polarization functions are investigated. Comparisons are made to earlier calculations and to qualitative bonding schemes. Calculated ligand-to-metal charge-transfer energies are significantly lower than the observed values. Atomic Xα calculations on the transition atoms from Sc to Cu suggest that this is in part due to limitations of the exchange-correlation potential and that similar errors should be expected for other Xα calculations of transition-metal complexes.

15877 Divalent lanthanide chemistru. Preparation of some four- and six-coordinate bis[(trimethylsilyl)amido] complexes of europium (II). Crystal stryctures of bis[bis(trimethylsilyl)amido]bis(1,2-dimethoxyethane)europium (II). Tilley, T.D.; Zalkin, A.; Andersen, R.A.; Templeton, D.H. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *Inorganic Chemistry ;* **20**: No. 2, 551-554(Feb 1981).

The yellow, hydrocarbon-soluble, divalent derivatives of europium(II) of the type $[(Me_3Si)_2N]_2Eu(L)_2$, where L is tetrahydrofuran or 1,2-dimethyoxyethane, and $[(Me_3Si)_2N]_2Eu(bpy)$ have been prepared. The crystal structure of $[(Me_3Si)_2N]_2Eu[MeOCH_2CH_2OMe]_2$ has been determined by single-crystal x-ray diffraction methods. The crystals are monoclinic, C2/c, with cell dimensions a = 13.398 (4) A, b = 17.454 (6) A, c = 15.013 (5) A, β = 92.91 (3)°, and V = 3506 A^3. For Z = 4, the calculated density is 1.24 g/cm^3. The structure was refined to a conventional R factor of 0.039 by using 2259 data where $F^2 > \sigma(F^2)$. The Eu(II) atom is hexacoordinate and bonded to two nitrogen atoms of the two bis(trimethylsilyl)amido groups and to four oxygen atoms of the 1,2-dimethoxyethane ligands. The molecule has C_2 symmetry. The Eu(II)-N bond distance is 2.530 (4) and the Eu(II)-O distances are 2.634 (4) and 2.756 (4) A. The ethane carbon atoms in the 1,2-dimethoxyethane ligand are disordered.

15878 Stability quotients of some lanthanide cryptates in aqueous solutions. Burns, J.H.; Baes, C.F. Jr. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Inorganic Chemistry ;* **20**: No. 2, 616-619(Feb 1981).

Titrimetric methods were used to measure the stabilities in water of a number of cryptates of the types $[Ln^{3+}(Cryp)2.1.1]$, $[Ln^{3+}(Cryp)2.2.1]$, and $[Ln^{3+}(Cryp)2.2.2]$, where Ln represents various lanthanide elements. The results established the stability of these trivalent lanthanide complexes relative to those of lower valences and have shown that there is only a small effect of the variation of cation size among the lanthanides.

15879 Lanthanum and neodymium diiodide hydride phases and their hydrogen dissociation pressures. Imoto, H.; Corbett, J.D. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Inorganic Chemistry ;* **20**: No. 2, 630-633(Feb 1981).

In order to study the stability trends of halohydrides of transition metal and lanthanides, the pressure isotherms of LaI_2-H_2 and NdI_2-H_2 were measured. The stability of those halohydrides is discussed vis-a-vis the stability of hydrides. (DLC)

15880 Synthesis by hydrogen-driven disproportionation reactions. Synthesis and structure of the hexazirconium dodecahalide clusters Zr_6Cl_{12} and Zr_6Br_{12} and the double salt $Zr_6Cl_{12}.M_2ZrCl_6$(M = Na, K, Cs). Imoto, H.; Corbett, J.D.; Cisar, A. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Inorganic Chemistry ;* **20**: No. 1, 145-151(Jan 1981).

The ZrXH phases, X = Cr, Br, formed by reaction of H_2 with double-metal-layered ZrX at 150 to 450° are metastable and decompose at 630 to 780°C to ZrH_2 plus the cluster compound Zr_6H_{12}, the latter being isostructural with Zr_6I_{12}. Transport of

Zr_6Cl_{12} occurs in the sealed Ta container at about 800°C. The two cluster phases are also formed as powders from incomplete reactions of ZrX and ZrX_4 at 650 to 700°C, while the layered 3R-$ZrCl_2$ is more stable at lower temperatures. Decomposition of ZrClH in the presence of NaCl, or CsCl at 750°C yields the isostructural $M_2Zr_7Cl_{18}$ (M = Na, K, Cs) while ZrCl does not react with NaCl or KCl alone under the same conditions. The crystal structure of the double salt $K_2Zr_7Cl_{18}$ was solved by single-crystal diffractometer methods (R anti 3, a = 9.499 (2) A, c = 25.880 (6) A, R = 0.037, R/sub w/ = 0.049, 736 Mo Kα diffractions corrected for absorption). The structure contains the octahedral metal cluster Zr_6Cl_{12} slightly compressed along the anti 3 axis [d(Zr-Zr) = 3.224 (1), 3.178 (1) A] and edge bridged by chlorine. Halides in octahedral $ZrCl_6^{2-}$ groups occupy all exo positions of the clusters. The structure can also be described in terms of nine chlorine layers per cell containing regular potassium and vacancy substitutions together with zirconium (II) and zirconium (IV) in octahedral interstices. The Zr_6Cl_{12} and $Na_2Zr_7Cl_{18}$ phases quenched in the presence of hydrogen at ~ 1 atm do not contain hydrogen in the clusters.

15881 **Low-temperature (20 K) neutron diffraction study of $[K(crypt\text{-}222)]^+[Cr_2(CO)_{10}(\mu\text{-}H)]^-$. Influence of the lattice environment and the K^+ ion on the anion's metal carbonyl framework and the ordered Cr-H-Cr bond.** Petersen, J.L.; Borwn, R.K.; Williams, J.M. (West Virginia Univ., Morgantown). *Inorganic Chemistry ;* **20**: No. 1, 158-165(Jan 1981).

A combination room-temperature x-ray and low-temperature (20 +- 1 K) neutron diffraction study of $[K\text{-}(C_{18}H_{36}N_2O_6)]^+[Cr_2(CO)_{10}(\mu\text{-}H)]^-$ has been performed to determine the anion's configuration in the absence of crystallographic site symmetry constraints. Although the K^+ ion is surrounded by the cryptate molecule, the ion influences the anion's solid-state structure. The relatively close separation of 2.966 (3) A between the K^+ ion and 01 of the anion is nearly equal to the sum of the corresponding ionic radii of ca. 2.9 A and thereby suggests the presence of an appreciable cation-anion interaction. Although this attractive interaction does not noticeably perturb the local C/sub 4 σ/ symmetry of the respective $Cr(CO_5$ fragment, it causes the anion's eclipsed metal carbonyl structure to undergo a twisting distortion toward a previously unobserved bent structure. The two independent $Cr(CO)_5$ groups of the anion are rotated ca. 19° with respect to each other about the Cr-Cr line. This configurational change in the metal carbonyl framework is accompanied by a reduction of the Cr-Cr separation to 3.300 (4) A and the Cr-H-Cr bond angle to 145.2 (3)°, which collectively imply an increase in the metal-metal bonding component of the closed three-center, two-electron Cr-H-Cr bond. The ordered bridging hydrogen atom resides in a symmetrical electronic environment as suggested by the two independent, but equivalent, Cr-H separations of 1.735 (5) and 1.723 (5) A. These Cr-H distances are comparable in magnitude to the corresponding distances in the $[Et_4N]^+$ and $[(Ph_3P)_2N]^+$ salts. The neutron diffraction data were measured with an automated four-circle diffractometer at the Brookhaven high-flux beam reactor.

15882 **Bonding in metal borohydride complexes.** Edelstein, N. (California Berkeley Lab., CA). Contract W-7405-ENG-48. *Inorganic Chemistry ;* **20**: No. 1, 297-299(Jan 1981).

From the tabulation it appears that an ionic radius of ~ 1.6 +- 0.1 A can be assigned to the borohydride ligand when it forms a bidentate bridge to the metal atom and ~ 1.36 +- 0.06 A when it forms a tridentate bridge to the metal atom. The difference in energy between the various possible modes of bonding is small, and the coordination number of the metal ion and the steric hindrance by other ligands appear to determine which mode of attachment will prevail for the borohydride ligand.

15883 **Some incorrect space groups: an update.** Marsh, R.E. (California Inst. of Tech., Pasadena); Schomaker, V. *Inorganic Chemistry ;* **20**: No. 1, 299-303(Jan 1981).

This update covers $Nb_2Br_6(SC_4H_8)_3$, $Ta_2Br_6(SC_4H_8)_3$, $[Ru_2(O_2CCH_3)_4(H_2O)_2]BF_4$, $Ru_2O_2(CC_2H_5)_4Cl$, and catena-bis [μ-N-methylpiperidinium-4-thiolato)]-cadmium (II) perchlorate dihydrate.

15884 **Molecular structure of the lithium enolate of acetaldehyde.** Lynch, T.J.; Newcomb, M.; Bergbreiter, D.E.; Hall, M.B. (Texas A and M Univ., College Station). Contract W-7405-ENG-48. *Journal of Organic Chemistry, The ;* **45**: No. 24, 5005-5006(21 Nov 1980).

Calculations of the structures of isomers of the lithium enolate of acetaldehyde done at the restricted Hartree-Fock level with the HONDO program on the CDC 7600 are reported. Using the standard 4-31 G basis set, these calculations produce excessively large bond angles, and this favors the most open of the three isomeric structures. Including the polarization functions on the carbons and oxygen and using the recent Dunning and Hayes [3s2p/2s] contraction indicates that the chirol enolates are the lowest energy structure. However, the differences of the various enolate structures are small and could be modified by solvent effects. These results are proported to suggest that the enolates containing internal ligands may be prepared such that a new chirol center would exist by virtue of the counterion position. (BLM)

15885 **GeH_5i and the proton affinity of monogermane.** Senzer, S.N.; Abernathy, R.N.; Lampe, F.W. (Pennsylvania State Univ., University Park). Contract AS02-76ER03416. *Journal of Physical Chemistry, The ;* **84**: No. 23, 3066-3067(13 Nov 1980).

Ion beam-scattering gas studies show that GeH_4D^+ is formed in bimolecular reactions of GeH_4 with $C_2D_2^+$, $C_2D_3^+$, $C_2D_5^+$, $C_3D_7^+$, and D_3S^+. The dependence of the reaction cross sections on ion energy shows the formation of GeH_4D^+ from $C_2D_2^+$, $C_2D_3^+$, and $C_2D_5^+$ to be via exothermic reactions, while formation from $C_3D_7^+$ and D_3S^+ is endothermic. These limits, combined with known thermochemical data, lead to the conclusion that the proton affinity of monogermane is in the range 7.03 to 7.11 eV. Monogermane is thus a stronger Bronsted base than monosilane by 0.43 eV.

15886 **High-temperature vaporization thermodynamics of lanthanum and yttrium monophosphides as determined by Knudsen effusion.** Franzen, H.F. (Ames Lab., IA (USA)); Hariharan, A.V. (Iowa State Univ., of Science and Technology, Ames (USA). Dept. of chemistry). *Journal of Chemical Thermodynamics, The ;* **12**: No. 10, 975-984(Oct 1980).

The high-temperature vaporizations of LaP(s) and YP(s) were studied by mass-spectrometric and target-collection Knudsen-effusion techniques. The stoichiometric monophosphides vaporize according to: $LnP(s) = Ln(g) + \alpha P(g) + 0.5(1\text{-}\alpha)P_2(g)$, where Ln = La (2075 to 2316 K), or Y (2107 to 2300 K). Thermodynamic values for the atomization reactions are given. Based on the second-law results and the thermodynamic values for the elements, calculated values of $\Delta H°sub(f)(LaP,s,298.15\ K)$ and $S°(LaP,s,298.15\ K)$, and corresponding values for YP are given.

15887 **Pt/Al_2O_3. I. Percentage exposed and its effect upon the reactivity of adsorbed oxygen.** Kobayashi, M.; Inoue, Y.; Takahashi, N.; Burwell, R.L. Jr.; Butt, J.B.; Cohen, J.B. (Northwestern Univ., Evanston, IL). *Journal of Catalysis ;* **64**: No. 1, 74-83(Jul 1980).

A set of platinum catalysts on γ-alumina was prepared by impregnation with $Pt(NH_3)_2(NO_2)_2$ aq and $Pt(NH_3)_4(NO_3)_2$ aq. Calcination at 200 to 400°C followed by reduction at 300 to 500°C gave percentages exposed of platinum as measured by hydrogen chemisorption at 25°C (D/sub h/) approx. = 100%. Direct reduction of incompletely dried material led to lower values of D/sub h/. The ratio D/sub t//D/sub h/(D/sub t/ is the percentage exposed by hydrogen-oxygen titration at 25°C) was unity for D/sub h/ < 45%, but it fell progressively below unity at larger values of D/sub h/. At D/sub h/ > 90%, not all oxygen adsorbed at 25°C reacted with pulses of hydrogen at 25°C. The ratio O/Pt/sub s/ increased with increasing temperature of adsorption of oxygen and at large enough O/Pt/sub s/, reaction with hydrogen at 25°C became incomplete for all catalysts. The value of O/Pt/sub s/ at which reaction became incomplete was structure sensitive and decreased with increasing D/sub h/, from about 1.15 for D/sub h/ = 36% to 0.5 for D/sub h/ = 94%. At smaller D/sub h/, O/Pt/sub s/ became about 2 after exposure to oxygen at 300°C; at D/sub h/ near 100%, O/Pt was about 1.15. Properties of Pt/SiO_2 and Pt/Al_2O_3 for these reactions are compared.

15888 **Pt/Al_2O_3. II. Activity and selectivity patterns for methylcyclopropane hydrogenolysis and cyclopentane exchange with deuterium: comparison with Pt/SiO_2.** Wong, S.S.; Otero-Schipper, P.H.; Wachter, W.A.; Inoue, Y.; Kobayashi, M.; Butt, J.B.; Burwell, R.L. Jr.; Cohen, J.B. (Northwestern Univ., Evanston, IL). Contract EG-77-S-02-4254. *Journal of Catalysis ;* **64**: No. 1, 84-100(Jul 1980).

The activity and selectivity of a series of Pt/Al_2O_3 catalysts for the hydrogenolysis of methylcyclopropane and exchange between deuterium and cyclopentane have been determined. The series investigated included the range from 4.1 to 106 percentage exposed of platinum (D/sub h/). Turnover frequencies, N/sub t/, for methylcyclopropane hydrogenolysis at 0°C determined after high-temperature pretreatment (H_2, T/sub p/ > 350°, 1) were independent of D/sub h/ as were the activation energies for i-butane and n-butane formation, 36.4 +- 2 and 42.3 +- 4 kJ mol^{-1}, respectively. For cyclopentane-deuterium exchange at 81°C the isotopic distribution patterns were clearly dependent upon D/sub h/, particularly noted as a decrease in $d_{10}/(d_2\text{-}d_{10})$, with increasing D/sub h/. Activation energy for overall exchange was about 75 kJ mol^{-1} with some dependence on D/sub h/ for the individual distributions. Catalyst pretreatment conditions affect activity for both reactions. For methylcyclopropane a minimum is observed for T/sub p/ about 200°C, with an inversion in ordering of N/sub t/ vs D/sub h/ at higher temperatures, as previously observed for Pt/SiO_2. For cyclopentane, N/sub t/ decreases with increasing D/sub h/ at T/sub p/ = 450°C. The method of catalyst preparation also showed some effect on N/sub t/ for methylcyclopropane, but not for cyclopentane. A summary discussion of the factors responsible for various pretreatment effects on $Pt/SiO/_2$ and Pt/Al_2O_3 is given for both reactions.

15889 **Preparation and use of crystalline bis-monoorganic phosphonate and phosphate salts of tetravalent metals.** Maya, L. (to Dept. of Energy). US Patent Application 163,367. 26 Jun 1980. 19p.

A method of preparing and using the crystalline organic derivatives of the tetravalent metal phosphates and phosphonates provides for the contacting of an aqueous solution of a metal nitrate, with a solution of an organophosphorus acid for a period of time at room temperature that is sufficient for the formation of a metal phosphate product, and thereafter recovering said product. According to the invention, the product of the disclosed process is used in effecting analytical separations, such as ion exchange and chromatography.

15890 **Method for directly recovering fluorine from gas streams.** Orlett, M.J.; Saraceno, A.J. (to Dept. of Energy). US Patent Application 143,246. 24 Apr 1980. 13p.

This invention is a process for the direct recovery of gaseous fluorine from waste-gas streams or the like. The process comprises passing the gas stream through a bed of anhydrous K_3NiF_6 pellets to fluorinate the same to K_3NiF_7 and subsequently desorbing the fluorine by heating the K_3NiF_7 pellets to a temperature re-converting them to K_3NiF_6. The efficiency of the fluorine-absorption step is maximized by operating in a selected and conveniently low temperature. The desorbed fluorine is highly pure and is at a pressure of several atmospheres. Preferably, the K_3NiF_6 pellets are prepared by a method including the steps of forming agglomerates of hydrated K_3NiF_6, sintering the agglomerates to form K_3NiF_5 pellets of enhanced reactivity with respect to fluorine, and fluorinating the sintered pellets to K_3NiF_6.

15891 **Nitrogen isotope fractionation in the Fischer-Tropsch synthesis and in the Miller-Urey reaction.** Kung, C.C. (Univ. of Chicago, IL); Hayatsu, R.; Studier, M.H.; Clayton, R.N. *Earth and Planetary Science Letters ;* **46**: 141-146(1979).

Nitrogen isotope fractionations have been measured in Fischer-Tropsch and Miller-Urey reactions in order to determine whether these processes can account for the large $^{15}N/^{14}N$ ratios found in organic matter in carbonaceous chondrites. Polymeric material formed in the Fischer-Tropsch reaction was enriched in ^{15}N by only .3% relative to the starting material (NH_3). The ^{15}N enrichment in polymers from the Miller-Urey reaction was 10 to .12%. Both of these fractionations are small compared to the 80 to .90% differences observed between enstatite chondrites and carbonaceous chondrites. These large differences are apparently due to temporal or spatial variations in the isotopic composition of nitrogen in the solar nebula, rather than to fractionation during the production of organic compounds.

15892 **Adsorption of mercury(II) by iron hydrous oxide gel.** Kinniburgh, D.G.; Jackson, M.L. (Univ. of Wisconsin, Madison). Contract EY-76-S-02-1515. *Soil Science Society of America Journal ;* **42**: 45-47(1978).

Freshly prepared iron hydrous oxide gel suspensions, 0.093M and 0.001M with respect to Fe, strongly adsorb Hg(II) from solutions containing 2.5 x 10^{-5} M Hg(II) and 1.0 x 10^{-5}M Hg(II), respectively. The pH at which 50% of the total adsorption occurred in the latter system is 4.3. In the presence of chloride (Cl/Hg(II) mole ratio of 4/1), the adsorption of Hg(II) is considerably reduced, with no significant coadsorption of ^{36}Cl, indicating that Hg(II)-Cl complexes are not adsorbed by Fe gel.

15893 **(ORNL-tr—4717) Study of the effect of solution admixtures on the crystallization of some sulfates.** Stroitelev, S.A. Translated from *Uchenye Zapiski Tomskogo Gosudarstvennogo Universiteta ;* No. 36, 158-170(1960). 24p. NTIS, PC A02/MF A01.

The effect of solution admixtures on crystallization was investigated by the use of a dilatometric method. This article contains results and summaries of the following experiments: crystallization of epsomite, $MgSO_47H_2O_4$ from a solution with a borax admixture; effect of admixtures of different sulfates on crystallization of epsomite; effect of sulfate admixtures on crystallization of K_2SO_4; effect of admixtures of different sodium salts on crystallization of mirabilite, $Na_2SO_41OH_2O$; and stability of hydrates in the presence of codissolved admixtures and the habit of the crystals. The general conclusion from these studies is that the effect of admixtures on the growth of crystals is exerted through a change of the physicochemical state of the solution and through a change of the composition and stability of its compound.

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15894 **(AD-A—084136) Role of iodine motion on the electronic properties of tetrathiofulvalene iodide (TTF-I/sub n/, n approximately 0.7). Interim technical report.** Latif, S.M. (California Univ., Santa Barbara (USA)). Mar 1980. Contract N00014-76-C-1044. 97p. NTIS, PC A05/MF A01.

The response of electric current in the quasi-one-dimensional conductor TTF-I/sub n/ (n approximately 0.7) under high electric fields has been investigated. A large portion of this thesis is comprised of presentation and interpretation of some puzzling phenomena observed under high pulsed bias. The phenomena include negative-resistance-like behavior, memory effects, erratic occurrence of oscillations with approximately 70 MHz frequency, and several others. The numerical values assoicated with all the phenomena except the oscillation frequency fluctuate erratically even when the experiments are repeated on the same sample. The crystal structure of TTF-I/sub n/ consists of two incommensurate sublattices, a rigid TTF sublattice and a seemingly flexible iodine sublattice. Based on such structural properties, it is postulated that the iodine ions have appreciable mobility, restrained only due to pinning at impurities and atomic defects. The structure suggests that, under high field, the iodine sublattic transforms from the ordered phase to a disordered phase. It is further postulated that the changes in sample conductance observed under high field are due to a localization of the carriers along the TTF stacks caused by the phase transition of the iodine sublattice.

15895 **Infrared spectrum of CTF_3 and implications toward tritium isotope separation by infrared laser multiple-photon dissociation of halogenated methanes.** Herman, I.P.; Marling, J.B. (Univ. of California, Livermore). Contract W-7405-ENG-48. *Journal of Physical Chemistry, The ;* **85**: No. 5, 493-496(5 Mar 1981).

The infrared absorption spectrum of nearly pure CTF_3 was measured and compared with the fundamental absorption frequencies calculated by using published CHF_3 and CDF_3 general harmonic force fields. The agreement between calculated and observed frequencies is found to be satisfactory. On the basis of calculated and measured absorption frequencies, photochemical separation of T from H is very attractive in trifluoromethane when using CO_2 laser multiple-photon dissociation near the strong CTF_3 ν_2 band centered at 1077.0 cm^{-1}. Photochemical separation of both T from H and T from D is attractive when using a CO laser near the strong CTF_3 ν_1 band centered at 1930.3 cm^{-1}.

15896 **Liquid-phase pyrolysis of 1,2-diphenylethane.** Miller, R.E.; Stein, S.E. (West Virginia Univ., Morgantown). Contract EF-77-G-01-2751. *Journal of Physical Chemistry, The ;* **85**: No. 5, 580-589(5 Mar 1981).

This paper presents results of a kinetic study of the decomposition of 1,2-diphenylethane in the liquid phase between 350 and 425°C along with a thorough mechanistic analysis of this system using thermochemical kinetics analysis and computer modeling. Toluene, trans-1,2-diphenylethene, and 1,1-diphenylethane are important products throughout the range of decomposition studied, with 1,2,3,4-tetraphenylbutane being a major product in the early stages of reaction and diphenylmethane becoming important after extensive decomposition. Some noteworthy aspects of this reaction are the following: (1) all major products in the early stages of reaction can be quantitatively accounted for by a free-radical reaction model employing reasonable kinetic parameters; (2) trans-1,2-diphenylethene is formed by both a direct and indirect route involving α-1,2-diphenylethyl radicals; () 1,1-diphenylethane appears to be formed by a thermodynamically uphill neophyl rearrangement; (4) above ~ 10% reaction secondary reactions lead to formation of diphenylmethane and a noticeable divergence of predicted and observed product concentrations. This work presents the first use of thermochemical kinetics principles for analysis of complex liquid-phase pyrolytic reactions and represents a first step toward establishing a reliable and self-consistent set of rate parameters for interpretation of these reactions.

15897 **Coordination chemistry of metal surfaces. 2. Chemistry of CH_3CN and CH_3NC on nickel surfaces.** Friend, C.M.; Stein, J.; Muetterties, E.L. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *Journal of The American Chemical Society ;* **103**: No. 4, 767-772(25 Feb 1981).

The Ni surfaces studied were the low Miller index planes (111), (110), and (100) and the stepped and stepped-kinked planes 9(111) x (111) and 7(111) x (310), respectively. Effects of surface C, S, and O_2 contaminant atoms on the chemistry were examined. CH_3CN was weakly and reversibly bound on the (111), stepped, and stepped-kinked surface and was probably oriented with the CN vector normal to the flat surface sections. The thermal desorption temperature was about 90°C. Some irreversible decomposition, probably focused at step or kink sites, was observed in the thermal desorption experiments. CH_3CN on the super-stepped (110) surface largely underwent decomposition on heating; very little reversible chemisorption was observed. Binding of the nitrile on the (100) surface was significantly different than for the more closely packed (111) surface; the thermal desorption temperature maximum was about 20°C higher than for Ni(111)-$NCCH_3$. The Ni(100)-$NCCH_3$ state was ordered, c(2 x 2); here the nitrile nitrogen atom may lie in the fourfold sites. Labeling studies of the CH_3CN chemisorption showed there was no reversible bond breaking process from 20 to ~ 100°C. Neither carbon nor sulfur altered this Ni surface-CH_3CN chemistry. Methyl isocyanide was strongly bound to all the Ni surfaces and essentially could not be thermally desorbed from the clean surfaces; decomposition to H_2(g) and N_2(g) prevailed. Sulfur contaminant atoms on the nickel surfaces did not alter this chemistry but C did. CH_3NC chemisorbed on C-containing Ni(111), Ni[9(111) x (111)], and Ni[7(111) x (310)] surfaces rearranged on heating and desorbed as CH_3CN at ~ 90°C. The chemistry was similar on the C-containing (110) and (100) surfaces to that for CH_3CN on the respective Ni(110)-C and Ni(100)-C surfaces.

15898 **Coordination chemistry of metal surfaces. 3. Benzene and toluene interactions with nickel surfaces.** Friend, C.M.; Muetterties, E.L. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *Journal of The American Chemical Society ;* **103**: No. 4, 773-779(25 Feb 1981).

Ni surfaces were the low Miller index planes (111), (110), and (100) and the stepped and stepped-kinked surfaces 9(111) x (111) and 7(111) x (310). Effects of surface C and O were established for low surface coverages. Benzene chemisorption was fully associative (molecular) on Ni(111) up to 100°C; no H-D exchange occurred between C_6H_6 and C_6D_6 up to 100°C. Up to 100°C, benzene was displaced as C_6H_6(g) by $P(CH_3)_3$. Benzene reversible thermal desorption occurred at 115 to 125°C, accompanied by extensive irreversible decomposition to H_2(g) + Ni(111)-C. Analogous behavior was observed for benzene chemisorbed on the stepped and stepped-kinked surface. On the (110) surface, the benzene thermal desorption and benzene chemical displacement by $P(CH_3)_3$ was comparable to the stepped-kinked surface. Chemisorption of benzene on Ni(100) was differentiated from the other surfaces: the degree of thermal reversibility was higher than and the temperature for the thermal desorption maximum was 100°C higher than that for Ni(111). H-D exchange did not occur with D_2 + C_6H_6 and with C_6H_6 + C_6D_6 on Ni(100). Toluene chemisorption on all the nickel surfaces was thermally irreversible and toluene was not displaced from these surfaces by strong field ligands like $P(CH_3)_3$ and CH_3NC. Heating the Ni-toluene surfaces led to hydrogen evolution. For the decomposition of $C_6D_5CD_3$ on Ni(111) there were two D_2 thermal desorption maxima, 130 and 190°C. For the analogous decomposition of $C_6H_5CD_3$ and $C_6D_5CH_3$ respectively, there were single D_2 desorption curves with maxima at 130 and 185°C, respectively. Thus, aliphatic C-H bonds are broken first and no aromatic C-H bond is broken until near 160°C. Identical behavior was observed for the stepped and stepped-kinked surfaces, and an analogous behavior was observed for the (100) surface.

15899 **Mechanism of the benzidine rearrangement. Kinetic isotope effects and transition states. Evidence for concerted rearrangement.** Shine, H.J. (Texas Tech Univ., Lubbock); Zmuda, H.; Park, K.H.; ; Kwart, H.; Horgan, A.G.; Collins, C.; Maxwell, B.E. *Journal of The American Chemical Society ;* **103**: No. 4, 955-956(25 Feb 1981).

When hydrazobenzene rearranges in acid solution, benzidine and diphenyline are formed. Nitrogen and carbon isotope effects were calculated for concerted and dissociative transition states for the formation of benzidine. These calculations are in excellent agreement with experiment for the concerted formation of benzidine and suggest that formation of diphenyline is a dissociative process. (DLC)

15900 **Cyclopeptide alkaloids. Synthetic, spectroscopic and conformational studies of phencyclopeptine model compounds.** Goff, D.; Lagarias, J.C.; Shih, W.C.; Klein, M.P.; Rapoport, H. (Univ. of California, Berkeley). *Journal of Organic Chemistry, The ;* **45**: No. 24, 4813-4817(21 Nov 1980).

Peptide cyclization via the p-nitrophenyl ester of 4-methyl-3[4'β-[[[N'-[(tert-butyloxy)carbonyl]-L-prolyl]amino]ethyl]phenoxy]pentanoic acid (9) has afforded a single cyclopeptide diastereomer, (5S,9R)-9-isopropyl-5,6-trimethylene-8-deamino-1,2-dihydro-p-phencyclopeptine (4), in 36% yield. From the comparative analysis of the uv,ir, circular dichroism (CD), and ^1H NMR spectra of 4 and cyclopeptide (5S)-5,6-trimethylene-8-deamino-1,2-dihydro-p-phencyclopeptine (3d), of known geometry, the conformational identities of the 14-membered ring systems were ascertained. From these data the assignment of R stereochemistry at C9 for cyclopeptide 4 was deduced. Since the stereochemistry at C9 in the naturally occurring phencyclopeptines is the same, these results suggest a feasible route to the stereoselective total synthesis of the phencyclopeptines.

15901 **Highly stabilized radicals: benzylic radicals in polycyclic aromatic systems.** McMillen, D.F.; Trevor, P.L.; Golden, D.M. (SRI International, Menlo Park, CA). Contract AC03-79ER-10483. *Journal of The American Chemical Society ;* **102**: No. 24, 7400-7402(19 Nov 1980).

Results are reported of measurements of the rate at which ethylbenzene, 1-ethylnaphthalene and 9-ethylanthracene undergo

benylic bond cleavage to produce benzyl radical analogs. A very low-pressure pyrolysis (VLPP) technique was used for the measurements. The VLPP technique was also used to measure equilibrium constants for the C-C bond scission reaction and proved to be a more direct route for calculation of the enthalpy of this reaction which produced highly stabilized arylmethyl radicals. (BLM)

15902 **Method for purifying bidentate organophosphorous compounds.** McIsaac, L.D.; Krupa, J.F.; Schroeder, N.C. (to Dept. of Energy). US Patent Application 143,381. 24 Apr 1980. 12p.

Bidentate organophosphorous compounds are purified of undesirable impurities by contacting a solution of the compounds with a mercuric nitrate solution to form an insoluble mercuric bidentate compound which precipitates while the impurities remain in solution. The precipitate is washed and then contacted with a mixture of an aqueous solution of a strong mercuric ion complexing agent and an organic solvent to complex the mercuric ion away from the bidentate compound which then dissolves in the solvent. The purified bidentate compounds are useful for extracting the actinide elements from aqueous acidic nuclear waste solutions.

15903 **Valence bond orbital model as an interpretive framework for understanding electronic structure.** Kirtman, B. (Univ. of California, Santa Barbara); Palke, W.E.; Chipman, D.M. *Israel Journal of Chemistry ;* **19**: 82-87(1980).

For purposes of interpretation and understanding, the valence bond orbital model of electronic structure provides a number of advantages over the more common molecular orbital model. This derives primarily from the unique description of valence bond orbitals in terms of highly localized bond pairs, lone pairs, etc. Optimization of the orbitals by a self-consistent-field procedure brings out features which were not evident from the semi-empirical treatments of earlier workers. Calculations on CH_4, NH_3, H_2O and H_2S show that optimized valence bond orbitals are often bent even at the equilibrium nuclear configuration and generally do not follow the nuclei when bond angles are varied. Analysis of a large basis set calculation on H_2O shows that the valence bond wavefunction can be fitted well with a minimal basis, making it possible to interpret more clearly the connection between hydridization and interorbital angles. It is shown how the valence bond method provides a rigorous basis for factorization even of difficult second order physical properties, such as polarizability, into separated bond and lone pair contributions. These contributions can be further decomposed into sums of atomic valence state values plus corrections due to bond polarization effects. Finally, the advantages of using the valence bond model as a starting point for the perturbation treatment of electron correlation are pointed out. Calculations on H_2 and LiH indicate that valence bond theory need only be carried through second order to obtain results comparable in accuracy to a third order treatment based on molecular orbitals.

15904 **Retention of ring structure in cyclopentane and alkylcyclopentane molecular cations.** Sieck, L.W.; Meot-Ner, M.; Ausloos, P. (National Bureau of Standards, Washington, DC). *Journal of The American Chemical Society ;* No. 102, 6866-6867(1980).

All measurements were made with the NBS high-pressure photoionization mass spectrometer. The fractional of $C_5H_{10}^+$ ions in a cyclopentane-cyclohexane mixture were determined as a function of pressure in order to define the fraction of the ions which did charge exchange with cyclohexane; i.e. the fraction which remained cyclic after ionization. The data for mixtures of various compositions (2.5 to 10% cyclohexane) are summarized for measurements performed at 10.62 eV: (a) 292K, > 96% cyclic; 347 K, ≧ 94% cyclic; 386 K, 84 +- 4% cyclic; and 412 K, 78 +- 6% cyclic; entropy, enthalpy, and activation energy were determined; 10.49 eV was obtained as the ionization potential of cyclopentane. 1 figure.

15905 **Photooxygenations of nitrogen heterocycles.** George, M.V.; Bhat, V. (Univ. of Notre Dame, IN). *Chemical Reviews ;* **79**: No. 5, 447-478(1979).

This review attempts to catalogue some of the reported photooxygenated reactions of different nitrogen heterocycles. Attention has been focused on the different types of products formed in these reactions and some of the suggested pathways for their formation. Although detailed studies on the mechanism of photooxygenation reactions have been performed, there is a scarcity of such studies in the area of nitrogen heterocycles. The examples included in this review are mostly those of photooxygenation reactions brought about in the presence of a sensitizer. In some cases, unsensitized photooxidations may also be involved. 157 references.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 15874, 15910

15906 **Metallocene electrochemistry. 2. Reduction-oxidation behavior of nickelocene in the room-temperature alkylpyridinium chloride-aluminum chloride melt system.** Gale, R.J.; Job, R. (Colorado State Univ., Fort Collins). *Inorganic Chemistry ;* **20**: No. 1, 40-42(Jan 1981).

In neutral 1:1 molar ratio mixtures of $AlCl_3$-1-butylpyridinium chloride, at 40°C, nickelocene undergoes a reversible 1-electron charge-transfer reaction, with E/sub 1/2/ = -0.165 V vs. Al (2:1) reference. Evidence is presented to show that both nickelocene and the nickelocenium (III) ion are unstable in chloride ion rich solvents. Spontaneous oxidation to the nickelocenium cation occurs in acidic (> 1:1) melts, and a stable dication is formed reversibly at E/sub 1/2/ = +0.912 V vs. Al (2:1) reference. Electronic spectra of nickelocene species in the II, III, and IV oxidation states have been recorded in these melts. The spectrum of the dication species contains bands at 412, 438, 532 nm.

15907 **Metallocene electrochemistry. 3. Reduction-oxidation study of dicyclopentadienyl compounds of ruthenium and titanium in Lewis acid-base molten salts.** Gale, R.J.; Job, R. (Colorado State Univ., Fort Collins). *Inorganic Chemistry ;* **20**: No. 1, 42-45(Jan 1981).

Voltammetry at vitreous C electrodes of $Ru(eta^5\text{-}C_5H_5)_2$ and $Ti(eta^5\text{-}C_5H_5)_2Cl_2$ in the 0.8:1 molar ratio $AlCl_3$-1 butylpyridinium chloride melt reveals an irreversible oxidation (E/sub p/2/ = = +0.68 V, 100 mV s^{-1}) and a reversible 1e reduction (E/sub 1/2/ = -0.65 V vs. SCE), respectively. These electrode potentials are comparable to those found for each species in nonaqueous, organic electrolytes. In the acidic melts (excess $AlCl_3$), $Ru(eta^5\text{-}C_5H_5)_2$ is oxidized by multistep pathways sensitive to the melt composition, while the $Ti(eta^5\text{-}C_5H_5)^{2+}$ dication is reduced by a reversible 1e step (E/sub 1/2/ = +0.67 V vs. SCE, 2:1 mole ratio melt) in a pCl^- dependent process. Electrochemical behavior of each of these metallocenes in neutral 1:1 molar ratio melts is complicated.

4005 Photochemistry

REFER ALSO TO CITATION(S) 15444, 15895, 15904, 15905

15908 **Laser photodetachment from aromatic anions in nonpolar solvents.** Sowada, U.; Holroyd, R.A. (Brookhaven National Lab., Upton, NY). *Journal of Physical Chemistry, The ;* **85**: No. 5, 541-547(5 Mar 1981).

A combined x-ray visible-dye-laser double-pulse technique is used to determine the photodetachment (action) spectra of the anions of biphenyl, trans-stilbene, pyrene, perylene, benzperylene, coronene, and nitrobenzene in nonpolar solvents. Quantum yields of electrons (phi/sub e/) are reported for the visible transitions, and photodetachment is shown to be a major process for visible light. For pyrene and trans-stilbene anions the quantum yields are 0.47 and 0.31 independent of solvent. For perylene and benzperylene anions phi/sub e/ is solvent dependent. The results are interpreted in terms of autoionizing excited states which can also internally convert to ground state anions. The mechanism of autoionization and the lifetime of the excited states in solution are discussed.

15909 **Determination of rate constants for photosolvation reactions: solvent dependence of chloride substitution rates for excited states of cis-dichlorobis(2,2'-bipyridine)iridium(III).** Divisia, B.; Ford, P.C.; Watts, R.J. (Univ. of California, Santa Barbara). *Journal of The American Chemical Society ;* **102**: No. 24, 7264-7268(19 Nov 1980).

Emission quantum yields, lifetimes, and spectra as well as photosolvation yields have been determined for cis-dichlorobis(2,2'-bipyridine)iridium(III), $IrCl_2(bpy)_2^+$, and its deuterated analogue $IrCl_2(bpy\text{-}d_8)_2^+$ in water, methanol, dimethylformamide, and acetonitrile. Both charge-transfer and ligand-field excited states contribute to the decay properties in fluid solutions. Rates of photosolvation are strongly solvent dependent, consistent with a dissociative or dissociative interchange mechanism. Rates of radiationless decay are also strongly solvent dependent as are the intensity distributions in the emission spectra. Upward movement of the charge-transfer state in water solutions accounts for the large contribution of the ligand-field emission in this solvent relative to nonaqueous media.

15910 **Highly luminescent polypyridyl complexes of osmium(II).** Kober, E.M.; Sullivan, B.P.; Dressick, W.J.; Caspar, J.V.; Meyer, T.J. (Univ. of North Carolina, Chapel Hill). *Journal of The American Chemical Society ;* **102**: No. 24, 7383-7385(19 Nov 1980).

The spectral and electrochemical properties of mixed ligand complexes of Os are reported. The data indicated that excited-state lifetimes are progressively enhanced by the substitution of ligands that are π acceptors, i.e., acetonitrile or alkylarylphosphines substituted for biopyridyl or phenanthroline. Thus, by making proper substitutions, it should be possible to obtain a graded series of low-lying metal to ligand charge-transfer excited stat lifetimes which extend from tens of nanoseconds to lifetimes even longer than the $\sim$ 500 and 800 μs that have been observed for the phenanthroline and bipyridyl complexes of Ru. (BLM)

15911 **Mechanistic aspects of the quenching of triplet methylene blue by complexes of cobalt(II).** Ohno, T.; Lichtin, N.N. (Boston Univ., MA). Contract EY-76-S-02-2889. *Journal of Physical Chemistry, The ;* **84**: No. 23, 3019-3023(13 Nov 1980).

A Q-switched ruby laser emitting 1.0-J flashes at 693.4 nm was used in a flash-photolytic, kinetic-spectrometric investigation of the mechanism of quenching of 10 μM triplet methylene blue by Co/sup II/(edta)$^{2-}$, Co/sup II/(TIM)$(H_2O)_2^{2+}$, Co/sup II/$(phen)_3^{2+}$, and Co/sup II/$(tpy)_2^{2+}$ [edta = ethylenediamine-N,N-N',N'-tetraacetic acid; TIM = 1,4,8,11-tetraaza-2,3-dimethylcyclotetradeca-1,3,8,10-tetraene; phen = 1,10-phenanthroline; and tpy = 2,2',2''-terpyridine] in water and aqueous EtOH at pH $\sim$ 2 and $\sim$ 6, where the species quenched and the product of its reductive quenching are, respectively, $^3MBH^{2+}$ and MBH^+. Specific rates of quenching, k/sub q/, of net electron transfer during quenching, k/sub et/, and the kinetics of decay of the products of quenching were determined. Specific rates, k/sub ret/, of reverse electron transfer from MBH^+. to complexes of Co(III), Co/sup III/ L/sub x//sup m+1/, were evaluated by generating MBH^+. by quenching $^3MBH^{2+}$ with diphenylamine in the presence of Co/sup III/L/sub x//sup m+1/. Values of F_1 = k/sub et//k/sub q/, of F_2 = k/sub ret//k/sub D/, where k/sub D/ is the diffusion-controlled specific rate of encounter, and of $F_1 + F_2$ are compared with analogous data for quenching of $^3MBH^{2+}$ by complexes of Fe(II) and with the detailed reversible electron-transfer model which was developed for the latter processes. It is concluded that reversible electron transfer is not the only significant mechanism of quenching of $^3MBH^{2+}$ by the four complexes of Co(II) employed in this research. At least one other mechanism, e.g., energy transfer or physical quenching, is followed to a significant degree.

4006 Radiation Chemistry

15912 **(PNL—3700(Pt.4)) Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.** Nielsen, J.M. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Feb 1981. Contract AC06-76RL01830. 184p. NTIS, PC A09/MF A01.

Separate abstracts were prepared for the 16 sections of this progress report which deals with the physics and chemistry of various energy technologies including coal, fission, geothermal and oil shale. (KRM)

15913 (PNL—3700(Pt.4), pp 41-46) **Track structure.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

We are developing a Monte Carlo code, MOCA13, to calculate ionization and energy imparted in submicron sites by MeV positive ions. This code draws on extensive data for electron production in ion-molecule collisions as the source term for energy degradation calculations. The systematics of molecular cross sections are being analyzed to provide information on how molecular structure affects energy deposition calculations. We are assessing the reliability of calculations that use gas-phase cross sections to determine energy transport in the condensed phase. To make this assessment, we are comparing calculated multicollision electron spectra with measurements of the corresponding electron spectra emitted from foil targets on proton impact.

15914 (PNL—3700(Pt.4), pp 47-52) **Energy transport.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

The measurement of primary interaction cross sections and the incorporation of these data into Monte Carlo calculations provide detailed information about the initial spatial distribution of absorbed dose. As part of our theoretical energy transfer studies, we are attempting to use this information to predict the evolution of chemical species formed as a result of energy deposition. We have developed a stochastic model of diffusion kinetics. Our experimental program in time-resolved emission spectroscopy has played an integral part in the development of this model by providing a simple chemical system in which track structure effects can be measured on a nanosecond time scale. Our stochastic model predicts different chemical yields for radiations with the same LET because of differences in the radial distribution of absorbed dose. These predictions are being tested through experiments with pulsed heavy-ion beams with the same stopping power but different velocity and charge.

15915 **Theoretical identification of a radical produced by radiolysis of uracil.** Chipman, D.M. (Univ. of Notre Dame, IN). *Radiation Research ;* **85**: No. 2, 257-261(Feb 1981).

Ab initio calculations were performed to determine the identity of a radical produced in the radiolysis of aqueous solutions of uracil. The radical in question can be produced in basic solution by .OH attack at the C_6 position of uracil or in neutral solution by a mechanism involving ionization by SO_4^- and subsequent deprotonation. Proposed structures include a ring-opened radical 3 and a ring-closed radical 4. Calculations were made on various conformations of 3 as well as on 4 and two isomers of 4. Comparison with the experimental isotropic hyperfine coupling constants, as well as energetic considerations, clearly point to 4 as being the radical actually observed.

15916 **ESR study of dialkyl carbonate radical anions and their thermal and photochemical dissociation in the solid state.** Hudson, R.L. (Eckerd Coll., St. Petersburg, FL); Williams, F. *Journal of Physical Chemistry, The ;* **85**: No. 5, 510-517(5 Mar 1981).

Dialkyl carbonate radical anions have been identified by ESR spectroscopy in γ-irradiated samples of the parent compounds at 77°K. The α-^{13}C hyperfine couplings (A/sub double vertical bar/ = 159.5 G, A/sub perpendicular to/ = 127.8 G) for the dimethyl carbonate radical anion were measured with a ^{13}C-enriched sample, and they show that the radical is pyramidal at the α carbon, as expected. Also, comparison with analogous radicals indicates appreciable spin delocalization onto the carbonyl oxygen. These dialkyl carbonate radical anions were found to undergo both a thermal and a photochemical β-scission reaction to produce the corresponding alkyl radicals. In addition to studies on polycrystalline dimethyl carbonate and diethyl carbonate, polycrystalline and glassy samples of di-n-propyl carbonate were examined, and similar results obtained for all four systems.

15917 Reactivity of benzyl cation and of benzhydryl cation with alkenes in solution: initiation step in cationic polymerization. Wang, Y.; Dorfman, L.M. (Ohio State Univ., Columbus). *Macromolecules ;* **13**: No. 1, 63-65(Jan 1980).

The pulse radiolysis technique has been used to determine rate constants for the initiation step in cationic polymerization. The reactivity of the benzyl cation and of the benzhydryl cation toward some 13 alkenes in dichloroethane solution has been determined. The rate constants vary over four orders of magnitude with the molecular structure of the nucleophiles. The reactivity-molecular structue dependence is discussed.

15918 Radiation damage with biological specimens and organic materials. Glaeser, R.M. (Univ. of California, Berkeley). pp 423-436 of Introduction to analytical electron microscopy. Hren, J.J.; Goldstein, J.I.; Joy, D.C. (eds.). New York, NY; Plenum Publishing Corporation (1979).

The radiation damage referred to in this chapter is defined as any changes in the physical structure or chemical makeup of the specimen which occur as a result of exposure to the electron beam. Radiation damage occurs in organic materials predominantly as a consequence of inelastic scattering of the incident electrons which frequently results in molecular ionization and radiolysis. Other types of radiation damage which can occur are specimen etching, which occurs as the result of synergistic action of electron irradiation and the presence of certain residual gasses, and specimen heating which occurs only at electron current densities that are large on the scale of ionization damage. The primary events in radiation physics and radiation chemistry and signal-to-noise considerations are also discussed in some detail. (KRM)

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 15862, 15889

15919 Characterization of bromine-77-labeled proteins prepared using myeloperoxidase. McElvany, K.D.; Welch, M.J. (Washington Univ., St. Louis, MO (USA). Edward Mallinckrodt Inst. of Radiology); Barnes, J.W. (Los Alamos Scientific Lab., NM (USA)). *International Journal of Applied Radiation and Isotopes ;* **31**: No. 11, 679-688(Nov 1980).

Myeloperoxidase has been used to label proteins with ^{77}Br at neutral pH. The essential reaction parameters were varied to obtain those conditions which resulted in the highest yield of radiolabeled protein. Proteins labeled with radiobromine using myeloperoxidase were found to contain bromotyrosyl residues as the predominantly labeled species. The integrity of proteins labeled with bromine-77 using the myeloperoxidase technique was investigated by several in vivo and in vitro methods. The ^{77}Br-proteins were superior to proteins radioiodinated by conventional methods, indicating that the enzymatic labeling method results in stable attachment of the radiobromine to the protein without significantly altering the structure of the protein molecule.

15920 (DOE/ER/04721—4) Experimental nuclear and radiochemistry. Progress report, February 1, 1980-January 31, 1981. Karol, P.J. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Chemistry). Nov 1980. Contract AS02-78ER04721. 42p. NTIS, PC A03/MF A01.

Deep nuclear spallation reactions induced by high-energy light particles on complex nuclei were investigated. Experimental studies involve activation of various medium to heavy mass targets bombarded by pi-mesons, protons and alpha particles. A prime objective is to deconvolve the cascade and evaporation steps in the reaction mechanism. Emphasis has been placed on spallation products far from yield maxima where the deconvolution is most justifiable. Irradiations have been performed predominantly at the Clinton P. Anderson Los Alamos Meson Physics Facility. Results of cross section determinations from bombardments of ^{89}Y, ^{92}Mo, ^{96}Mo and ^{100}Mo with 800 MeV protons have nearly been completed, providing comparison of isobaric and mass-yield distributions. Data have also been obtained at 500 MeV. Theoretical efforts are being directed at the evaporative behavior of very high-temperature nuclei as determined by the nuclear equation of state and how such behavior might be observed in very deep spallation processes. In addition, the soft spheres model has been combined with spallation systematics to explore the feasibility of high-intensity beams to incinerate high-level nuclear wastes and also to predict interaction lengths in nuclear emulsion studies of relativistic heavy ions. Data are presented on spallation of ^{130}Te by 800-MeV protons, decay of ^{87}Zr, and ^{84}Zr, spallation-transmutation of ^{90}Sr, and anomalous relativistic projectile fragments in emulsion detectors. (DLC)

15921 (PNL—3700(Pt.4), pp 29-40) Initial interaction process. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

In our study of the initial interaction processes in the absorption of energy from a radiation field by biologically significant material, we have continued to concentrate on the measurement and interpretation of differential ionization cross sections for fast charged particles. Of particular interest is the determination of cross section systematics and interaction mechanisms, which will enable extrapolation of experimental results into regions where experiments are either impractical or not feasible. During the past year, we have investigated interaction mechanisms for proton impact by taking measurements and performing Born approximation calculations for the ionization of neon, krypton, and xenon by 2.0- to 4.2-MeV protons. We have also begun a systematic study of the hard-collisions component of single differential ionization cross sections. Our investigation of collisions involving ions that have bound electrons has been extended by measurements of differential ionization cross sections for C^+ with energies from 0.8 to 4.2 MeV and by a theoretical investigation of screening in heavy-ion collisions. A study of interaction mechanisms contributing to autoionizing spectra in heavy-ion collisions was also completed.

15922 Raman spectra of uranyl ion and its hydrolysis products in aqueous HNO_3. Toth, L.M.; Begun, G.M. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Journal of Physical Chemistry, The ;* **85**: No. 5, 547-549(5 Mar 1981).

Raman spectra of aqueous uranyl ion have been neasured as a function of pH and uranyl concentration. The ν_1 symmetrical stretching vibration has been found to consist of three bands at 869, 851, and 836 cm^{-1} which are identified as belonging to the UO_2^{2+}, $(UO_2)_2(OH)_2^{2+}$, and $(UO_2)_3(OH)_5^+$ ions, respectively. The Raman spectral measurements correlate with equilibrium thermodynamic measurements.

15923 Crystal and molecular structure of hydridotris[bis(trimethylsilyl)amido]uranium (IV). Andersen, R.A.; Zalkin, A.; Templeton, D.H. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *Inorganic Chemistry ;* **20**: No. 2, 622-623(Feb 1981).

New hydride derivatives of thorium(IV) and uranium(IV), $HM[N(SiMe_3)_2]_3$, have been prepared recently. This paper describes the crystal structure of the uranium species, though the hydride ion was not located, and shows that the thorium analogue is isostructural. The reaction chemistry and spectroscopy show that these derivatives are authentic examples of four-coordinate, monomeric hydride, compounds.

15924 Gas-phase properties of bis(1,1,1,5,5,5-hexafluoropentane-2,4-dionato)(trimethyl phosphato)dioxouranium(VI). Ekstrom, A.; Randall, C.H. (Australian Atomic Energy Commission, Sydney). *Inorganic Chemistry ;* **20**: No. 2, 626-629(Feb 1981).

Vapor pressure measurements and ligand exchange experiments, (TMP-TPPO) were conducted to study the dissociation of $UO_2(HFA)_2TMP$. (DLC)

15925 Synthesis and characterization of some fluorinated uranium(IV) β-diketonates. DeVito, V.L.; Wester, D.W. (Argonne National Lab., IL (USA)). *Journal of Inorganic and Nuclear Chemistry ;* **42**: No. 12, 1719-1723(1980).

Several U(IV) compounds with fluorinated and bulky β-diketones have been synthesized by a novel route. The compounds

have been characterized by elemental and mass spectroscopic analyses, IR and electronic spectroscopy and X-ray powder diffraction patterns. The electronic and steric effects of the β-diketone substituents on the properties of the compounds are discussed.

15926 **Phase behavior in the berkelium-oxygen system.** Turcotte, R.P.; Chikalla, T.D. (Pacific Northwest Power Group, Richland, WA (USA)); Haire, R.G. (Oak Ridge National Lab., TN (USA)); Fahey, J.A. (Bronx Community Coll., New York (USA)). *Journal of Inorganic and Nuclear Chemistry ;* **42**: No. 12, 1729-1733(1980).

This work describes a high temperature X-ray diffraction study of the BkOsub(x) system under equilibrium conditions. The observed phase behavior is shown to be compatible with previous oxygen-dissociation pressure measurements and a phase diagram is suggested, composed in essence of two widely nonstoichiometric phases: σ(bcc) for $1.5 < O/Bk$ approximately < 1.70 and α(fcc) for approximately $1.78 < O/Bk < 2.00$.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 15269, 15429

15927 **(UCRL—85585) Future aspects of modeling combustion chemistry.** Westbrook, C.K.; Dryer, F.L. (Lawrence Livermore National Lab., CA (USA); Princeton Univ., NJ (USA)). 25 Feb 1981. Contract W-7405-ENG-48. 34p. (CONF-810330—1). NTIS, PC A03/MF A01.

From Combustion Institute/Central States Section technical meeting; Warren, MI, USA (23 Mar 1981).

The use of chemical kinetics in combustion models takes two extreme forms. Detailed reaction mechanisms provide a wealth of information which can be important in the analysis of specific physical and chemical processes. Examples of this type of model application were described, and it was emphasized that the results of such studies can have rather wide applications to a variety of combustion environments. At the other extreme, simplified reaction mechanisms can be very useful in models of actual combustors such as internal combustion engines, gas turbines, and furnaces. Some care must be exercised that the simplified kinetics models used still reproduce available experimental data for relevant conditions, but when this restriction is observed the resulting overall system model provides valuable help in the analysis of practical combustion. Future developments in both areas will increase the amount of detailed information available and the complexity of the practical combustion systems which can be examined by these modeling techniques.

42 ENGINEERING

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 15248, 15363, 15375, 15400, 15967, 15995, 15998

15928 **(AD-A—088196) Percolation and electrical conduction in superconducting composites. Interim report.** Lobb, C.J. (Harvard Univ., Cambridge, MA (USA). Div. of Applied Sciences). Aug 1980. Contracts N00014-77-C-0085;N00014-75-C-0648. 129p. NTIS, PC A07/MF A01.

We report the experimental properties of a number of random superconducting-normal metal composites. Theoretical interpretation is also presented, with emphasis on the effects of geometrical randomness. The electrical properties of in situ multifilamentary Cu-V_3Ga wires are discussed, with emphasis on critical current and field properties which are relevant to applications. We found that these wires had upper critical fields as high as 22.4T at 4.2K with a transition temperature of 15.5K. Their overall critical current density compared favorably with commercial wires. The results of electrical measurements on in situ Cu alloy-Nb composites are reported which elucidate the roles of percolation and the proximity effect in these materials. Our data show that the proximity effect is very important in clean, low superconducting concentration samples, with geometrical percolation being more important as the matrix becomes dirtier. In addition, we discuss models for the superconducting to normal transition in these materials which include the effects of randomness and thermal fluctuations. A two-dimensional thin film system based on Cu-Pb is discussed and shown to be qualitatively similar to the three-dimensional in situ composites.

15929 **(DOE/ER/10709—1) Method of vibrational control in the problem of stabilization of chemical reactors. Progress report, July 1, 1980-June 30, 1981.** Meerkov, S.M. (Illinois Inst. of Tech., Chicago (USA)). Mar 1981. Contract AC02-80ER10709. 23p. NTIS, PC A02/MF A01.

Results are described which were obtained during the first year of the three year study of vibrational control (VC) approach to the problem of stabilization of Continuous Stirred Tank Chemical Reactors (CSTR). The objective of the first year study was the analysis of the efficiency of the VC in increasing the area of stability of CSTR. This objective was achieved on the basis of the following development. Equations describing the dynamics of CSTR under periodic oscillations of input flow rate were derived and linearized equations were obtained. These equations are characterized by a periodic matrix diagonal elements of which are not equal to zero. In this case, the traditional VC routine is not applicable. A new routine of VC was developed applicable to the mentioned situation. Also, the basis of nonlinear VC theory was established. The developed routine was applied to the equations of CSTR in order to show that VC allows to stabilize the steady states where the rate of conversion is of the order of 0.5. This implies that the productivity of the reactor can be increased, theoretically speaking, by a factor of 3 divided by 5.

15930 **(IKE—5-196) Study of a temperature-stabilized heat pipe system with electrical feedback.** Hage, M. (Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). Jun 1980. 128p. (In German). NTIS (US Sales Only), PC A07/MF A01.

Thesis.

The thesis covers the experimental and theoretical study of a gas-stabilized ammonia-argon heat pipe feedback system and is aimed at achieving very precise temperature stabilization of a heat source to which the heat pipe system is coupled thermally. The influences of a number of parameters upon the heat carrying capability and precision of control of the heat pipe system are studied, both with respect to steady-state and dynamic behavior, e.g., of variable operating temperatures changing cooling temperature conditions of the cooling zone and the reservoir, and the necessary auxiliary power of the reservoir heater. Theoretical predictions are made on the basis of numerical calculation. This includes modification of an existing computer program, FEDCON. The prediction is established by thermal decoupling of cooling zone and reservoir modes of cooling. Changes in the boundary conditions also allow a heat pipe system to be calculated for control of any temperature within a specified range of temperatures.

15931 **(MLM—2800(OP)) Testing of laminar flow, HEPA filter, clean installations at Mount Facility.** Mielke, R.L. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 4p. (CONF-810505—2). NTIS, PC A02/MF A01.

From Institute of Environmental Sciences annual meeting; Los Angeles, CA, USA (4 May 1981).

The essentials needed to operate and maintain a good laminar flow, HEPA filter, clean room program are: testing and certification of the clean enclosures, operations correctly placed within the clean enclosures, and people awareness of clean enclosure procedures. The methods used for the testing and certification program of clean enclosures (clean benches and clean rooms) at Mound Facility are described. The main topics covered are: air velocity test; HEPA filter integrity test; particle count test; and philosophy for these tests.

15932 **(NBS-MN—125(Suppl.1)) Thermocouple reference tables based on the IPTS-68: reference tables in degrees fahrenheit for thermoelements versus platinum (Pt-67).** Powell, R.L.; Burns, G.W. (National Bureau of Standards, Washington, DC (USA)). Mar 1975. 46p. GPO $1.05.

Revision of the International Practical Temperature Scale requires that there be changes for all accurately tabulated thermophysical values. Revised reference data for thermocouples have been generated in a cooperative program between groups of the National Bureau of Standards in Boulder and Gaithersburg. This Monograph contains tables, analytic expressions, various approximations, and explanatory text. Only the standard letter-designated thermocouples are described: noble metal Types S, R, and B and base metal Types E, J, K, and T. Their appropriate single-leg or thermoelement versus Pt-67 values are also included. The new reference data reflect not only revisions in the temperature scale, but also slight changes in the materials themselves and improvements in data fitting methods. The temperature ranges vary for different types, from a low of -270°C for Type E to a high of 1820°C for Type B. The main functions and tables are given in terms of Celsius degrees and microvolts. Tables in the appendices represent the data with less precision, in millivolts, and in degrees Fahrenheit as well as Celsius. Approximate quadratic, cubic, and quartic analytic expressions are also given for each thermocouple type in various temperature ranges.

15933 **(SAND—80-1614) Aerodynamic tests of a Strypi II/NASA/ECHO at Mach numbers of 4.98 and 7.82 (Test VI-101).** Tate, R.E. (Sandia National Labs., Albuquerque, NM (USA)). Oct 1980. Contract AC04-76DP00789. 28p. NTIS, PC A03/MF A01.

A Strypi II/NASA/ECHO model was tested in the Sandia 18-Inch Hypersonic Wind Tunnel to obtain six-component force data. Body-fin-rocket, body-fin, and body configurations were tested at Mach numbers of 4.98 and 7.82, three roll attitudes, (0, 45, and 90 degrees) and angles of attach from -6 to 8 degrees. All the data are presented in graphical and tabular forms in this report.

15934 **(SAND—80-2791) Measurement and calculation of radiation fields of the Sandia irradiator for dried sewage solids.** Morris, M.E. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 141p. NTIS, PC A07/MF A01.

The radiation field of the Sandia Irradiator for Dried Sewage Solids was measured. The results of the measurement are given in this report. In addition, theoretical calculations of the fields are given and then compared with the measured values. Elementary models of the radiation source geometry and irradiated product are found to be adequate and thus allow us to duplicate (through calculation) the important features of the measured fields.

15935 **(SAND—81-0261C) Brief history of laminar flow clean room systems.** Whitfield, W.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810505—1). NTIS, PC A02/MF A01.

From Institute of Environmental Sciences annual meeting; Los Angeles, CA, USA (4 May 1981).

This paper reviews the development and evolution of laminar flow clean rooms and hoods and describes the underlying principles and rationales associated with development of this type of clean room system and Federal Standard No. 209. By the mid 1970's, over a thousand hospitals in the US had installed laminar flow equipment in operating rooms. During the past several years a great deal of attention has been focused on conserving energy in clean rooms. Some gains in energy conservation have been achieved by improved design, off hours shutdown, and closer evaluation of requirements for clean rooms. By the early 1970's, the laminar flow principle had been carried from the Laboratory and applied to production hardware to create a mature industry producing and marketing a variety of laminar flow equipment in less than 10 years time. This achievement was made possible by literally dozens of persons in industry, government, military, and private individuals who developed hardware, added numerous innovations, and had the foresight to apply the technology to many fields other than industrial clean rooms. Now, with laminar flow devices available, class 100 levels are readily achievable and maintained, and at the same time require fewer operating restrictions than previously possible.

15936 **Slide system for machine tools.** Douglass, S.S.; Green, W.L. (to Dept. of Energy). US Patent Application 158,832. 12 Jun 1980. 12p.

The present invention relates to a machine tool which permits the machining of nonaxisymmetric surfaces on a workpiece while rotating the workpiece about a central axis of rotation. The machine tool comprises a conventional two-slide system (X-Y) with one of these slides being provided with a relatively short travel high-speed auxiliary slide which carries the material-removing tool. The auxiliary slide is synchronized with the spindle speed and the position of the other two slides and provides a high-speed reciprocating motion required for the displacement of the cutting tool for generating a nonaxisymmetric surface at a selected location on the workpiece.

15937 **Automatic thermocouple positioner for use in vacuum furnaces.** Mee, D.K.; Stephens, A.E. (to Dept. of Energy). US Patent Application 156,955. 6 Jun 1980. 12p.

The invention is a simple and reliable mechanical arrangement for automatically positioning a thermocouple-carrying rod in a vacuum-furnace assembly of the kind including a casing, a furnace mounted in the casing, and a charge-containing crucible mounted in the furnace for vertical movement between a lower (loading) position and a raised (charge-melting) position. In a preferred embodiment, a welded-diaphragm metal bellows is mounted above the furnace, the upper end of the bellows being fixed against movement and the lower end of the bellows being affixed to support means for a thermocouple-carrying rod which is vertically oriented and extends freely through the furnace lid toward the mouth of the crucible. The support means and rod are mounted for relative vertical movement. Before pumpdown of the furnace, the differential pressure acting on the bellows causes it to contract and lift the thermocouple rod to a position where it will not be contacted by the crucible charge when the crucible is elevated to its raised position. During pumpdown, the bellows expands downward, lowering the thermocouple rod and its support. The bellows expands downward beyond a point where downward movement of the thermocouple rod is arrested by contact with the crucible charge and to a point where the upper end of the thermocouple extends well above the thermocouple support. During subsequent melting of the charge, the thermocouple sinks into the melt to provide an accurate measurement of melt temperatures.

15938 **Heat pump/refrigerator using liquid working fluid.** Wheatley, J.C.; Paulson, D.N.; Allen, P.C.; Knight, W.R.; Warkentin, P.A. (to Dept. of Energy). US Patent Application 154,173. 28 May 1980. 22p.

A heat transfer device is described that can be operated as a heat pump or refrigerator, which utilizes a working fluid that is continuously in a liquid state and which has a high temperature-coefficient of expansion near room temperature, to provide a compact and high efficiency heat transfer device for relatively small temperature differences as are encountered in heating or cooling rooms or the like. The heat transfer device includes a pair of heat exchangers that may be coupled respectively to the outdoor and indoor environments, a regenerator connecting the two heat exchangers, a displacer that can move the liquid working fluid through the heat exchangers via the regenerator, and a means for alternately increasing and decreasing the pressure of the working fluid. The liquid working fluid enables efficient heat transfer in a compact unit, and leads to an explosion-proof smooth and quiet machine characteristic of hydraulics. The device enables efficient heat transfer as the indoor-outdoor temperature difference approaches zero, and enables simple conversion from heat pumping to refrigeration as by merely reversing the direction of a motor that powers the device.

15939 **Small object transporter.** Winkler, M.A. (to Dept. of Energy). US Patent Application 152,012. 21 May 1980. 7p.

The disclosure relates to a small object transporter. Gas is passed through a conduit having a venturi. Small objects are picked up at a first location by a pickup tube in communication with the venturi and are forced out one end of the conduit at a desired second location.

15940 Compound lens. Brixner, B.B.; Klein, M.M.; Winkler, M.A. (to Dept. of Energy). US Patent Application 151,995. 21 May 1980. 14p.

The disclosure relates to at least one calcium fluoride optical element used in combination with at least two ordinary crown glass lens elements to greatly reduce secondary spectrum in optical systems.

15941 Hydrostatic bearings for a turbine fluid flow metering device. Fincke, J.R. (to Dept. of Energy). US Patent Application 145,940. 2 May 1980. 8p.

A rotor assembly fluid metering device has been improved by development of a hydrostatic bearing fluid system which provides bearing fluid at a common pressure to rotor assembly bearing surfaces. The bearing fluid distribution system produces a uniform film of fluid distribution system produces a uniform film of fluid between bearing surfaces and allows rapid replacement of bearing fluid between bearing surfaces, thereby minimizing bearing wear and corrosion.

15942 Method of fabricating a prestressed cast iron vessel. Lampe, R.F. (to Dept. of Energy). US Patent Application 138,804. 9 Apr 1980. 23p.

A method of fabricating a prestressed cast iron vessel wherein double wall cast iron body segments each have an arcuate inner wall and a spaced apart substantially parallel outer wall with a plurality of radially extending webs interconnecting the inner wall and the outer wall; the bottom surface and the two exposed radial side surfaces of each body segment are machined and eight body segments are formed into a ring. The top surfaces and outer surfaces of the outer walls are machined and keyways are provided across the juncture of adjacent end walls of the body segments. A liner segment complementary in shape to a selected inner wall of one of the body segments is mounted to each of the body segments and again formed into a ring. The liner segments of each ring are welded to form unitary liner rings and thereafter the cast iron body segments are prestressed to complete the ring assembly. Ring assemblies are stacked to form the vessel and adjacent unitary liner rings are welded. A top head covers the top ring assembly to close the vessel and axially extending tendons retain the top and bottom heads in place under pressure.

15943 Usng soluble neutron absorbers for criticality safety. Lloyd, R.C.; Bierman, S.R.; Clayton, E.D.; Durst, B.M. (Battelle Northwest Labs., Richland, WA). *Transactions of the American Nuclear Society ;* **34**: 325-327(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15944 Criticality of water-moderated and reflected plutonium arrays. Koponen, B.L. (Lawrence Livermore National Lab., CA). *Transactions of the American Nuclear Society ;* **34**: 327-328(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15945 Postmortem examination of a fire-exposed spent-fuel shipping cask. Rack, H.J.; Yoshimura, H.R. (Sandia Labs., Albuquerque, NM). *Transactions of the American Nuclear Society ;* **34**: 425-426(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15946 Finite-element solution of added mass and damping of oscillation rods in viscous fluids. Yang, C.I.; Moran, T.J. (Argonne National Lab., IL). *Journal of Applied Mechanics ;* **46**: No. 3, 519-523(Sep 1979).

A finite-element analysis is presented for the cylindrical rods oscillating periodically in an incompressible viscous fluid. A system of discretized equation is obtained from the appropriate Navier-Stokes and continuity equations through Galerkin's process. The basic unknowns are velocity and pressure. A mixed interpolation method is used. The added mass and viscous damping coefficients which characterize the fluid reaction force due to the rods oscillation can be obtained through a line integration of stress and pressure around the cirumference of the rods. For the special case of a cylindrical rod oscillating in a viscous fluid enclosed by a rigid, concentric cylindrical shell, the finite-element solution agrees well with the analytical closed-form solution, which, in turn, has been verified experimentally.

15947 Analysis of rotation and stress rate in deforming bodies. Dienes, J.K. (Los Alamos Scientific Lab., NM). *Acta Mechanica ;* **32**: 217-232(1979).

When a solid element experiences large deformations, the components of stress will, in general, vary as a result of material rotation. These changes occur even in the absence of additional strain, and need to be accounted for in formulating constitutive laws that involve the rate of change of stress. In this paper the correction terms are extended to the case when material axes become strongly skewed. An expression for the rate of material rotation as an explicit function of vorticity, rate of deformation and stretch is derived. It is then shown that the rate of change of stress depends on the rate of material rotation. As an example, expressions for material rotation and stress are derived for a hypoelastic material undergoing uniform, rectilinear, shear. The shear stress is compared with a solution that neglects skewing of the axes, and it is found that, for the example, skewing may be neglected for strains less than 0.4. Finally, the use of these relations in numerical calculations involving finite deformation is discussed.

15948 (DOE/ET/13511—T5) Development of automated welding process for field fabrication of thick walled pressure vessels. Schneider, U.A. (Westinghouse Electric Corp., Tampa, FL (USA). Nuclear Equipment Div.). [nd]. Contract AC05-78ET13511. 14p. NTIS, PC A02/MF A01.

Research on automatic welding processes for the fabrication of thick-walled pressure vessels continued. A literature review on the subject was completed. A laboratory study of criteria for judging acceptable root parameters continued. Equipment for a demonstration facility to test the components and processes of the automated welding system has been specified and is being obtained. (LCL)

4203 Lasers

REFER ALSO TO CITATION(S) 15808, 15841

15949 (AD-A—084132) Vib-rotational energy transfer and relaxation patterns in non-equilibrium chemical systems. Final report 15 Sep 77-14 Sep 79. Ben-Shaul, A. (Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry). Mar 1980. 74p. NTIS, PC A04/MF A01.

The characteristics of vibrational relaxation of diatomic molecules are analyzed using a combined kinetic-thermodynamic approach based on the master equation formalism on the one hand and the maximal entropy procedure on the other. The complex and detailed solutions for the vibrational relaxation of diatomic molecules (HF as a specific system) can be greatly compacted and systemized. The physical-mathematical significance of detailed balancing and quasi-equilibrium distributions in non-isothermal systems are discussed. It is shown that the increased efficiency of rotationally relaxed chemical lasers is due to the removal of thermodynamic constraints from the molecular distribution function. The different roles of reagent internal excitation on the rates of endoergic reactions at a given temperature and a given total energy are discussed and demonstrated.

15950 (AD-A—084196) Visible laser research one meter device. Interim report 1 Jul 79-28 Feb 80. Trainor, D.W.; Hyman, H. (Avco-Everett Research Lab., Everett, MA (USA)). 1980. Contract N00014-76-C-1032,. 53p. NTIS, PC A04/MF A01.

Stimulated Raman Scattering Experimental Results are discussed. The pump laser was XeF (lambda = 350 nm) and two step conversion to the blue-green spectral region was accomplished using molecular hydrogen and deuterium. Conversion efficiencies were measured and overall conversion from the UV to the blue-green of $> 40\%$ is reasonable.

15951 **(AD-A—084249) Infrared electro-optic system performance effects due to absorption by battlefield gases. Final report.** Leslie, D.H.; Eitner, P.G.; Manning, J.L.; Singer, S.M. (Science Applications, Inc., Ann Arbor, MI (USA). Optical Sciences Div.). Jan 1980. Contract DAEA18-73-A-0127. 54p. NTIS, PC A04/MF A01.

Estimates of laser and broadband infrared gaseous absorption are provided for several land battlefield scenarios. Quantity, dispersion, and concentration are discussed using a simple diffusion model. Sources treated are vapor products of TNT and RDX explosions, land fires, and vehicle emissions.

15952 **(AD-A—084265) Laser-supported combustion wave ignition in hydrogen. Technical report.** Conrad, R.W.; Pyles, C.E.; Roy, E.L.; Mangum, D.W. (Army Missile Command, Redstone Arsenal, AL (USA). Directed Energy Directorate). Oct 1979. 33p. NTIS, PC A03/MF A01.

Laser-supported combustion waves were generated in hydrogen at 45 psia. Propagation velocities were inferred from radiometric measurements and compared with values for air, adjsuted (according to Raizer's method) for differences in the physical properties of air and hydrogen. Coarse measurements of the radiant power in the visible region were made and compared with air plasmas produced by both pulsed and continuous wave (CW) carbon dioxide lasers.

15953 **(AD-A—084323) Free electron lasers with variable parameter wigglers. Technical report.** Kroll, N.M.; Morton, P.; Rosenbluth, M.N. (Stanford Research Inst., Arlington, VA (USA)). Feb 1980. Contract MDA903-78-C-0086,. 172p. NTIS, PC A08/MF A01.

A general discussion of free electron lasers with variable parameter wigglers is presented with a view towards their potential for the production of high power optical radiation at reasonable efficiency. The theoretical analysis is based upon a one dimensional relativistic Hamiltonian formulation and is developed in a manner to take advantage of the analogy between the free electron laser process and radio frequency accelerators. Three promising operational modes are identified and analyzed. The first may be thought of as an electron decelerator and is thought to have the most promise for single pass devices. Both oscillator and amplifier configurations are studied. The second is base upon adiabatic trapping and detrapping, intended to reduce the spread in electron energy typically induced by the FEL process. The third is based upon the method of phase area displacement. It has the advantage of wide gain bandwidth and small induced energy spread, and is thought to have the most promise for storage ring applications. Generally speaking, it is found that high peak power is intrinsic to these modes of operation. Potential problems from parasitic oscillations analogous to the stimulated Raman effect are analyzed, and some others arising from transverse inhomogeneity are identified.

15954 **(AD-A—084459) Computer program for the kinetics and populations in a xenon fluoride laser. Master's thesis.** Cole, L.W. (Naval Postgraduate School, Monterey, CA (USA)). Dec 1979. 88p. NTIS, MF A01.

To highlight in a qualitative manner the kinetics of an excimer laser, a simple computer model for calculating the species populations in a KrF laser cavity is developed; subsequently a computer program is modified to calculate the population of the different electronic configurations of excited neon present in a XeF laser. When modified, the NRL program accounts for 185 reactions and requires 9.5 minutes of CPU time using the IBM 360/67. The populations obtained are applied to the calculation of the index of refraction in the laser cavity. The phase shift is determined per unit length for two laser wavelengths; one laser wavelength is non-resonance with neon and the other is at resonance. Neon is the dominant specie relative to concentration and within the population distribution the neon ground state dominates by a factor of a million. The calculations show that the ground state neon determines the index of refraction.

15955 **Broadly tunable picosecond ir source.** Campillo, A.J.; Hyer, R.C.; Shapiro, S.L. (to Dept. of Energy). US Patent Application 143,059. 23 Apr 1980. 14p.

A picosecond traveling-wave parametric device capable of controlled spectral bandwidth and wavelength in the infrared is reported. Intense 1.064 μm picosecond pulses (1) pass through a 4.5 cm long $LiNbO_3$ optical parametric oscillator crystal (2) set at its degeneracy angle. A broad band emerges, and a simple grating (3) and mirror (4) arrangement is used to inject a selected narrow-band into a 2 cm long $LiNbO_3$ optical parametric amplifier crystal (5) along a second pump line. Typical input energies at 1.064 μm along both pump lines are 6 to 8 mJ for the oscillator and 10 mJ for the amplifier. This yields 1 mJ of tunable output in the range 1.98 to 2.38 μm which when down-converted in a 1 cm long CdSe crystal mixer (6) gives 2 μJ of tunable radiation over the 14.8 to 18.5 μm region. The bandwidth and wavelength of both the 2 and 16 μm radiation output are controlled solely by the diffraction grating.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 15702, 15703, 15929, 15933, 15938

15956 **(AD-A—084187) Digital image analysis of two phase flow data. Final report for FY 79.** Reischman, M.M.; Holzmann, J.M.; Hughes, N.H. (Naval Ocean Systems Center, San Diego, CA (USA)). 15 Jan 1980. 23p. NTIS, PC A02/MF A01.

The analysis of flow visualization data documenting a variety of fluid phenomena has been severly limited in the past by the subjective nature of data interpretation and limitations imposed by actual sample size. Video digitization offers a reliable method of automating the analysis of such visual data. This paper describes an experiment wherein the distribution of sizes of bubbles formed by air injection into a water stream was found. Previous results were limited to special cases due to the amount of data required for a full documentation. Several geometric and flow parameters were varied and their effects are reported. Data reduction was via a digital image processing system. This type of system holds the promise of high speed, objective data reduction for a broad range of fluid mechanics problems.

15957 **(AD-A—084450) Finite element methods for heat transfer problems. Final report 15 Jun 76-15 Sep 79.** Bishopp, F.; Caswell, R.B.; Michaud, M.E. (Brown Univ., Providence, RI (USA). Div. of Applied Mathematics). 2 Apr 1980. 94p. NTIS, PC A05/MF A01.

At the start, three and a half years ago, the finite fluid element method (Section 1) was the only one under consideration. Things went badly with that method, and progress with its implementation went far more slowly than we ever anticipated. As a result, by the end of the first year, a second method, which originally was developed for a check on results of the first, had become by far the more promising of the two. Most of this report (Sections 3-6) describes progress we have made with the application of biased differences (Section 2) to a variety of fairly difficult problems of numerical fluid mechanics. Finally, in the last six months of the period covered by this report, the major difficulties with finite fluid elements were overcome, so it became possible to begin a comparison of the two methods (Section 6). Preliminary indications are that both methods are reliable, and both are considerably more efficient than a third method with which they have been compared. Section 7 is a report of progress with a boundary integral method that is not closely related to the others except by being numerical, and Section 8 is a description of the kinds of graphical software we had to develop for interpretation of our numerical computations.

15958 **(K/CSD/TM—41) Formation and collision of isothermal shock waves in a torus.** Park, J.E. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Feb 1981. Contract W-7405-ENG-26. 50p. NTIS, PC A03/MF A01.

The Implicit-Compressible-Eulerian (ICE) method for compressible transient flows is being extended to use a new two-pass approximation for the convective and viscous terms. This technique has been recently developed for incompressible flows by Hirt. So far, the algorithm has been applied to isothermal flows in one dimension having periodic boundary conditions. As a demonstration problem, a toroidal shock tube is analyzed. A section of the tube is sealed with diaphragms and filled with high-pressure gas. As the calculation starts, the diaphragms are removed and the gas rushes through the torus. Eventually the high-speed fronts collide and re-

flect, reversing the flow in the torus. In this discussion, the ICE algorithm and its extension are briefly described. Calculated shock shapes in the toroidal tube are presented for an initial density ratio of 3.0. Comparison is made with the analytic theory.

15959 **(NUREG/CR—1422) Analytic rebalance technique for pressure calculation in two-phase flow systems. Technical memo.** Miao, C.C.; Shah, V.L.; Krazinski, J.L.; Sha, W.T. (Argonne National Lab., IL (USA)). May 1980. 37p. NTIS, PC A03/MF A01.

The present report describes the Analytic Rebalance Technique for the solution of two-phase fluid flow problems. The procedure is based on direct solution of only a section of the flow field at a time, along with rebalancing of the remaining flow field. The derivation of the equations and the step by step solution procedure are presented for developing a computer program for analyzing two-phase flows.

15960 **(PB—80-181647) Two-phase flow model test facility. Interim report 15 Aug 75-31 Jan 77.** Sallet, D.W.; Guehler, M.; Tsui, C.Y. (Office of the Publication Board, Washington, DC (USA)). Apr 1980. 26p. NTIS, PC A03/MF A01.

This report describes test facilities for the investigation of two-phase flows. The test facility completed to this date consists of the Blow-Down Test Apparatus and the Bubble and Slug Flow Tunnel. It is the purpose of the test facilities to support, test and aid in the development of safety valve sizing equations when different two-phase regimes occur.

15961 **(Y/EN—501) Energy-conscious air-side design: Phase I of energy use minimization.** Choat, E.E. (Oak Ridge Y-12 Plant, TN (USA)). 1981. 12p. (CONF-810101—7). NTIS, PC A02/MF A01.

From American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) meeting; Chicago, IL, USA (25 Jan 1981).

Of the many energy-conservation options available to the design engineer, a system-management approach is recommended as one that will effect maximum benefits to the owner. Systems management includes energy-conscious consideration of design criteria, design details, installation, testing and balancing, and operation. It requires the informed participation of the design engineer, contractor, testing and balancing (TAB) engineer, and owner/operator. Within limits, almost every component of HVAC systems offers an opportunity to conserve energy. Many of these impact energy determinants such as system static pressure, system total air flow, or the quantity of outside air. A few design considerations for energy conservation in a simple system and the impact that the TAB work has on these are illustrated. Particular attention is devoted to the energy impact of systems management, makeup air, and system static pressure.

15962 **Analysis of transient heat loss in earth-sheltered structures.** Szydlowski, R.F. (Ames Lab., IA); Kuehn, T.H. *Underground Space ;* **5**: No. 4, 237-246(Jan 1981).

The two-dimensional transient Fourier heat-conduction equation was solved in cartesian coordinates using an alternating-direction, implicit-finite-difference technique for several earth-sheltered-building configurations. The computer program was verified by comparing results with data taken from an instrumented conventional-residence basement. The model considers variable soil properties, different types of below-grade configurations, and various types, thicknesses, and locations of insulation. The program was used to analyze the thermal impact of varying levels of interior and exterior insulation on conventional basements, earth-bermed walls, and earth-covered structures, although only results for the earth-covered structures are presented. Heat loss and gain through the exterior building envelope versus location and time of year are given as functions of construction materials, insulation, and soil geometry. Temperature distributions within the building-envelope material and in the surrounding soil are presented in relation to time of year. An economic analysis is also given to indicate the cost-effectiveness of the insulation levels analyzed. 22 references, 10 figures, 5 tables.

15963 **Ceramic tube heat exchanger technology.** *Materials amp Components in Fossil Energy Applications ;* No. 29, 1-3(1 Dec 1980).

Technology for the design and fabrication of ceramic tube heat exchangers has been advanced significantly as a result of a recently concluded DOE Program at Solar Turbines International in San Diego, California. The objectives were to develop and identify technologies enabling the construction of a full-size, pressurized, high-temperature ceramic heat exchanger module. The program encompassed material strength screening tests, coal environment materials interaction tests, joining technology, heat exchanger module design, construction, and operations. The material evaluations included environmental studies on tubes and joints up to 2500°F in typical combustion atmospheres for times up to 1000 hours. Strength, strength distribution, and gas permeability were also measured. Heat-up and shutdown of a large heat exchanger are recognized to be key problems. Solutions to the problems that exist during transient operation included methods to limit peak stresses that develop in critical ceramic components. The methods examined were relaxing glass ceramic joints and use of mechanical tube-to-header joints. Adaptations of these approaches were analyzed and reviewed in order to match the design with fabrication capabilities and material limitations.

15964 **Two-fluid calculational methods.** Travis, J.R. (Los Alamos Scientific Lab., NM). *Transactions of the American Nuclear Society ;* **34**: 275-276(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15965 **Drift flux formulations and calculational methods.** Liles, D.R. (Los Alamos Scientific Lab., NM). *Transactions of the American Nuclear Society ;* **34**: 276-277(1980). (CONF-800607—).

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

15966 **Surface ablation in the impingement region of a liquid jet.** Swedish, M.J.; Epstein, M.; Linehan, J.H.; Lambert, G.A.; Hauser, G.M.; Stachyra, L.J. (Argonne National Lab., IL). *AIChE (American Institute of Chemical Engineers) Journal ;* **25**: No. 4, 630-638(Jul 1979).

A theoretical and experimental investigation of a water jet impinging on a melting solid surface has been carried out. Ice, octane, p-xylene, and olive oil served as the meltable solid materials, comprising a Prandtl number range of 5 to 2800. An available laminar stagnation flow model was utilized to describe melting heat transfer in the jet impingement region. Melting rate measurements were found to agree quite well with the values predicted with this model.

4205 Materials Testing

15967 **(ANL—80-123) Development of nondestructive evaluation techniques for high-temperature ceramic heat exchanger components. Third annual report, October 1979-September 1980.** Kupperman, D.S.; Yuhas, D.; Sciammarella, C.; Caines, M.J.; Winiecki, A. (Argonne National Lab., IL (USA)). Dec 1980. Contract W-31-109-ENG-38. 88p. NTIS, PC A05/MF A01.

The goals of the present program are not only to develop hardware and procedures for efficiently inspecting ceramic heat-exchanger components in conventional ways, but also to develop advanced NDE techniques that will allow effective failure prediction. The main objectives in FY 1980 have been to (a) develop a computer-interfaced ultrasonic bore-side probe for preservice and in-service inspection, (b) develop and assess techniques for inspection of SiC tubing by acoustic microscopy, and (c) carry out preliminary tests to compare ultrasonic, holographic, and infrared techniques with more conventional dye-penetrant and radiographic methods for inspection of butt joints in ceramic tubes. Circumferential notches, 125 μm deep x 250 μm long, on the inner and outer surfaces of sintered and siliconized SiC tubes were successfully detected with an ultrasonic bore-side probe. The acoustic microscope was modified to handle 30- as well as 100-MHz sound waves, since

the lower-frequency waves give better penetration of Sic tube walls. The modification decreased the acoustic noise. The ability to detect a notch only 250 x 125 x 75 μm in size was demonstrated. Efforts to examine a butt joint with dye-penetrant, radiographic, ultrasonic, and holographic-interferometry techniques revealed that while holography seemed to identify more clearly the presence of a crack-like inner surface flaw, ultrasonic pulse-echo and pitch-catch techniques at 22 MHz also indicated the presence of an anomaly; the ultrasonic and holographic results agreed with regard to angular location of the flaw.

15968 **(BDX—613-2319) Applications of the biuariate normal distribution.** Neal, B.J. (Bendix Corp., Kansas City, MO (USA)). Oct 1980. Contract AC04-76DP00613. 12p. (CONF-810503—1). NTIS, PC A02/MF A01.

From 35. annual quality congress and exposition; San Francisco, CA, USA (27 May 1981).

In industry there are many situations involving two variables, e.g., measurement from vendor product testing and customer testing of the same product; high temperature test measurements and ambient temperature measurements on a product. Bivariate methods of analysis should be used to summarize, represent, and interpret data sampled from populations where variable elements yield measures of two characteristics. The application of the bivariate normal distribution in solving certain types of industrial problems involving two variable measurements is examined. Three examples given illustrating its use in developing a product screening procedure, establishing a prediction model, an handling testing and measuring errors.

15969 **(IS-M—288) Dynamic photoelasticity as an aid to sizing surface crack by frequency analysis.** Singh, A.; Burger, C.P.; Schmerr, L.W.; Zachary, L.W. (Ames Lab., IA (USA)). Apr 1980. Contract W-7405-ENG-82. 20p. (CONF-8009135—1). NTIS, PC A02/MF A01.

From Conference on the mechanics of nondestructive testing; Blacksburg, VA, USA (10 Sep 1980).

A method using Rayleigh or surface waves for sizing surface cracks that have been modeled as machine slots is described. Dynamic photoelasticity was chosen to study the overall wave behavior and the mode conversions of a Rayleigh wave as it interacts with narrow slots cut from the edges of a two-dimensional plate model. This technique gives a full-field visualization of the stresses produced by an elastic wave traveling in a solid. The interaction between a Rayleigh wave and a slot was observed from a sequence of pictures taken with a high-speed Cranz-Schardin camera. The procedures and results are discussed. It was concluded that the ability of dynamic photoelasticity to produce full-field views of elastic stress fields can be used to provide an understanding of the ways in which the subsurface particle motions in Rayleigh waves are affected by a slot. As a consequence the Rayleigh wave property which relates the wavelength to its depth below the surface has been effectively used to find the depth of slots. The next step is to use conventional R-wave ultrasonic transducers on artificially machined slots or fatigue cracks to see how the slot depth relates to the cut-off wavelength. The transducers used should be broadband and the depth of the input R-wave should be greater than the slot depth so as to produce undercutting.

4207 Vacuum Engineering

REFER ALSO TO CITATION(S) 15994, 15999

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 16009, 16021

15970 **(SAND—80-1915) User's manual for the Functional Relay Operation Monitor (FROM).** Gustke, F.R. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 59p. NTIS, PC A04/MF A01.

Sandia's Digital Systems Development Division 1521 has developed a new functional relay tester. Capabilities of this tester include the measurement of coil and contact resistance, hipot, operate current, and contact operation and bounce times. The heart of the tester is a Hewlett-Packard 21MX minicomputer that uses BASIC or FORTRAN programming languages. All measurements are made by means of simple program calls, and all measurement standards are traceable to the National Bureau of Standards. Functional relay test data are stored on a disc drive and can be output as hard copy, manipulated in the computer, or sent over a distributed-system link to other Sandia computers. 17 figures, 4 tables.

15971 **(SAND—80-2625C) Dormant storage reliability assessments-data based.** Merren, G.T. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810510—4). NTIS, PC A02/MF A01.

From Electronic components conference; Atlanta, GA, USA (11 May 1981).

A relatively large amount of data pertaining to the performance of certain electronic parts after long periods of dormant storage has been collected and analyzed by the Reliability Department of Sandia National Laboratories. The failure models used by Sandia are presented and reliability assessments for selected electronic parts derived from these models and the measured performance data are provided. These data based assessments are compared to similar assessments derived from handbook calculations using the general data and models provided in the handbooks.

15972 **(SAND—81-0491C) LSI packaging that passes PIND test.** Dal Porto, J.; Loescher, D.; Olson, H.; Plunkett, P. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810510—1). NTIS, PC A02/MF A01.

From Electronic components conference; Atlanta, GA, USA (11 May 1981).

A packaged LSI chip or hybrid destined for military or space applications must pass the gambit of screens listed in Method 5004 of Mil-Standard-883B. These screens include the Particle Impact Noise Detection (PIND) test in which a sensitive acoustic transducer listens for loose particles inside a package while the package is vibrated and shocked. Prior to instituting new assembly procedures, PIND test yields were as low as 20%. We have use SEM and EDAX[1] to identify the particles that caused PIND test failures and have developed and are now using assembly procedures that result in a low reject rate at PIND testing. With these procedures, yields at PIND testing are aove 90%. The assemblies consisted of a 1 K RAM die with dimensions of 3.5 mm x 6.1 mm x 0.031 mm thick which is attached with gold/silicon eutectic to a 24-pin leadless hermetic package. Packages were solder sealed in a belt furnace with a gold-tin eutectio alloy preform and a nickel and gold plated Kovar lid. The major particle type which caused PIND test failures was determined to be gold-tin spheres from the gold-tin preform. To a much lesser degree, other particles such as calcium silicate, gold, and silicon were noted. The effect of furnace temperature, furnace ambient, and package orientation on the number of gold-tin solder balls detected in the sealed packages was investigated. The best results were obtained if the sealing furnace ambient was nonoxidizing, peak temperature was approximately 360°C, and the packages were sealed in a 45° lid down position.

15973 **(UCRL—85105) Electronic component documentation in a research-laboratory environment.** Spencer, J.W. (Lawrence Livermore National Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 5p. (CONF-810508—2). NTIS, PC A02/MF A01.

From 28. international technical communication conference; Pittsburgh, PA, USA (20 Mar 1981).

Documenting electronic components and assemblies used by design personnel at a scientific research laboratory presents some unusual challenges. We must provide up-to-date documentation which is complete enough to provide designers the information they need for unusual applications. Yet, because of the relatively small quantities of components used, the documentation must be inexpensive to produce and distribute. The system evolved depends on close interaction between technical publications editor/writers and components engineers, and results in components documentation manuals closely tailored to the needs of the design personnel. The philosophy underlying these documentation efforts, as well as the organization, production, and distribution of our component documentation are discussed.

15974 **Laminated insulators having heat dissipation means.** Niemann, R.C.; Mataya, K.F.; Gonczy, J.D. (to Dept. of Energy). US Patent Application 143,249. 24 Apr 1980. 7p.

A laminated body is provided with heat dissipation capabilities. The insulator body is formed by dielectric layers interleaved with heat conductive layers, and bonded by an adhesive to form a composite structure. The heat conductive layers include provision for connection to an external thermal circuit.

4209 Waste Processing Plants And Equipment

REFER ALSO TO CITATION(S) 15786, 15797

15975 (ANL/CNSV-TM—14, pp 243-248) **System Volund operation I/S Vestforbraending.** Gilbu, O. (Copenhagen West Incineration Plant, Glostrup, Denmark). Sep 1980.

From International conference on European waste-to-energy technology; Reston, VA, USA (29 Oct 1980).

The ownership, location, and waste quantity of the I/S Vestforbraending in Denmark is discussed briefly. Reception of the waste at the 12-municipality-owned company is described. The incineration plant, heat recovery, residue treatment, landfill, organization, planning of operation, and operational experiences are described.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 15270, 15273

15976 **(PB—80-179849) Advanced combustion systems for stationary gas turbine engines. Volume IV. Combustor verification testing. Addendum. Final report Jul-Oct 79.** Pierce, R.M.; Smith, C.E.; Hinton, B.S. (AiResearch Mfg. Co., Phoenix, AZ (USA)). Jan 1980. 119p. (FR—11405). NTIS, PC A06/MF A01.

The reports describe an exploratory development program to identify, evaluate, and demonstrate dry techniques for significantly reducing NOx from stationary gas turbine engines. Volume 4 describes an additional series of tests to evaluate the performance of the combustor on heavy fuels such as petroleum or shale residual oil and solvent refined coal (SRC). Results from the tests show that all exhaust emission goals were met while burning three test fuels: a middle-cut distillate SRC, a residual shale oil, and an Indonesian/Malaysian residual oil. It was also demonstrated that the exhaust emission goals were met when operating a RB/QQ combustor at a high turbine inlet temperature (1426 C design) firing No. 2 fuel oil.

4220 Underground Engineering

REFER ALSO TO CITATION(S) 15254

4240 Pollution Control Equipment

REFER ALSO TO CITATION(S) 15367, 15976

15977 **(DOE/EV/10506—T1) Advanced electrode design for electrostatic precipitators.** Bernstein, S.; Ushimaru, K.; Geller, E.W. (Flow Research Co., South Kent, WA (USA)). 1980. Contract AC03-81EV10506. 10p. NTIS, PC A02/MF A01.

The subject of this paper is a wavy electrode precipitator which employs a new collecting electrode. The wavy electrode precipitator incorporates a contoured collecting electrode geometry which produces a nearly uniform electric field along the electrode. This feature allows operation with higher average electric field strengths near the electrode than in conventional designs. The wavy electrode provides separated flow zones within its valleys, which fluid dynamically shield particles from the main stream. The design also provides mechanical rigidity to vertical bending without the sharp flanges normal to the flow commonly found in conventional precipitators. These features permit increased performance for all particle sizes, but especially help in the precipitation of fine particles which are normally the most difficult to collect.

15978 **(AD-A—084506) Effect of thermal decomposition of generator deposits in a rotary furnace on contamination of atmosphere.** Krause, U.; Sobota, J. Translated from *Ochrona Powietrza ;* **12**: No. 1, 1-5(21 Sep 1979). 18p. NTIS, PC A02/MF A01.

No abstract available.

43 PARTICLE ACCELERATORS

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 16270

15979 **(ANL-HEP-CP—80-22) Hadron and photon experiments at fixed-target accelerators.** Diddens, A.N.; Diebold, R.; Gaillard, J.M.; Galaktionov, Yu.V.; Gerstein, S.S.; Pilcheer, J.; Sosnowski, R. (Argonne National Lab., IL (USA)). 1979. Contract W-31-109-ENG-38. 25p. (CONF-7910125—7). NTIS, PC A02/MF A01.

From 2. ICFA workshop on possibilities and limitations of accelerators and detectors; Les Diablerets, Switzerland (4 Oct 1979).

Portions of document are illegible.

Possible hadron and photon experiments at 20 TeV stationary-target proton accelerator have been considered in order to see typical limitations and possibilities of the experiments in this new energy domain.

4302 Beam Dynamics, Field Calculations, And Ion Optics

15980 **(BNL—29234) Effect of the higher field multipoles in superconducting magents on the good field aperture.** Parzen, G. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—57). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The magnetic field in superconducting dipoles and quadrupoles have undesired higher multipoles present. These higher multipoles are caused by deviations from the ideal configuration of current and iron that produces a pure dipole or a pure quadrupole field. End effects are a source of higher multipoles. Correction coils may be provided which can be used to correct the effects due to some of the undesired multipoles, particularly the lower multipoles. The higher undesired multipoles, for which there are no effective correction coils, may limit the good field aperture of the magnet. The higher multipoles will curve the working line, the dependence of the ν-value on the momentum. The effects, that may limit the good field aperture, will depend on how the accelerator is operated. One effect that may limit the good field aperture is that the curvature of the working line due to the higher multipoles may make it difficult to control the transverse collective instability. For the case of the ISABELLE accelerator, one preliminary magnet design would lead to higher multipoles being present that could limit the good field aperture to a momentum acceptance of $\Delta p/p = 2\%$. It is found that the 20-pole multipole in the quadrupole plays a major role in limiting the aperture, and a modification of the quadrupole design could lead to a good field aperture of about $\Delta p/p = 3\%$, due to this higher multipole effect.

15981 **(BNL—29237) Magnetic field properties of the ISABELLE Project superconducting dipole magnets.** Kirk, H.G.; Engelmann, R.; Herrera, J.; Jaeger, K.; Robins, K.; Willen, E. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—60). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A series of prototype superconducting dipole magnets have been constructed and tested as part of the ISABELLE Project research and development program. Results of magnetic field measurements are presented with emphasis placed on the DC and AC components of the main field. Magnetization and the effects of the magnetic fields at the ends of the magnet are displayed.

15982 (BNL—29238) Calculations of capture efficiency of the debunched stack in ISABELLE. Ezura, E.; Raka, E.C. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—61). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A computer program which simulates particle behavior in the longitudinal phase space has been developed to investigate the rebunching process and capture efficiency of the debunched stack in ISABELLE. A simple expression for a capture efficiency for an arbitrary initial distribution has been derived and used to estimate capture efficiencies for several assumed distributions.

15983 (CONF-810314—46) Orbit dynamics in isochronous cyclotrons. Welton, T.A.; Nichols, T. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Acceleration of heavy ions in an isochronous cyclotron can lead to a ν/sub r/-value near unity for many turns. In ORIC, several departures from 3-fold symmetry unfortunately exist, so that a complex resonant behavior may lead to beam loss. To study these questions, a program has been initiated with the aim of devising and using very efficient algorithms for calculating the motion of ions during acceleration. The eikonal function was chosen as the basis for these studies, with methods and some results here described.

15984 (LA-UR—81-761) Transverse phase space time dependence of LAMPF's high intensity H+ beam. Hurd, J.; Browman, A. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 3p. (CONF-810314—28). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The LAMPF H+ injector is pulsed 120 times a second with pulse lengths from 500 to 750 μsec long. Large transients in transverse phase space, lasting 100 to 200 μsec after turn-on, are regularly observed. The magnitude of these transients appears to increase with increasing currents and source brightness. Because high-current accelerators require great precision in phase-space tailoring to avoid excessive emittance growth during acceleration, these transients cause severe operational problems and can no longer be neglected in the beam tuning procedure. Measurements of transverse phase space as a function of time for the 750 keV, 30-mA peak current H+ beam are presented.

15985 (LA-UR—81-765) Beam-intensity limitations in linear accelerators. Jameson, R.A. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810314—27). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Recent demand for high-intensity beams of various particles has renewed interest in the investigation of beam current and beam quality limits in linear RF and induction accelerators and beam-transport channels. Previous theoretical work is reviewed, and new work on beam matching and stability is outlined. There is a real need for extending the theory to handle the time evolution of beam emittance; some present work toward this goal is described. The role of physical constraints in channel intensity limitation is emphasized. Work on optimizing channel performance, particularly at low particle velocities, has resulted in major technological advances. The opportunities for combining such channels into arrays are discussed. 50 references.

15986 (LBL—11692) Beam energy measurements at the Bevalac. Crebbin, K.C. (Lawrence Berkeley Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 6p. (CONF-810314—18). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

In the Bevalac there are several problems that make it very difficult to determine a more precise value for magnetic field. The radial field shape enclosed within the B dot integrating loop on the poletips changes as a function of field strength. The effective magnetic quadrant length also changes as a function of field strength. This causes a major perturbation in the radial position of the equilibrium orbit as well as some uncertainty in the value of the magnetic field. In addition to the magnetic field value, there must be adequate information about the radial position of the closed orbit to determine a precise value for the kinetic energy. If there is sufficient information about the closed orbit, a known effective path length exists for the particle. The transit time of the particle on that path is a time-of-flight measurement. In a circular machine, this time measurement is a frequency measurement which is one of the most precise measurements that can be made. A Hewlett Packard 5360A frequency counter can read to 1 part in 10^6 for a 0.1 msec read time. This can be extended to 1 part in 10^{10} for longer read time. With time measured to this precision, the error in the kinetic energy is then determined by the error in the determination of the closed orbit. At a kinetic energy of 500 MeV/amu, the energy can be determined to +- 1/4% at the Bevalac.

15987 (LBL—12296) Numerical simulation of survey misalignment effects in the ATA structure. Close, E.R. (Lawrence Berkeley Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 4p. (CONF-810314—24). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A computer program MSALIGN incorporating solenoidal magnet positioning errors, survey alignment errors, and structure support sag has been written and used to simulate the Advanced Test Accelerator (ATA) inorder to investigate the effects of errors on the transported beam. Runs using up to 10K particles to represent the beam were made over ensembles of up to 100 misaligned machines. They show that for the ATA design tolerances the resultant beam steering is acceptable and easily corrected using steering magnets. Also, that for changes within a factor of 2 to 3 over design values the variation is linear. The program MSALIGN is general in design. Given the appropriate misalignment procedure it can simulate other machines or study other types of errors.

15988 (SAND—80-2437C) Beam breakup instability in pulsed transmission line linear accelerators. Adler, R.J.; Genoni, T.C.; Miller, R.B. (Sandia National Labs., Albuquerque, NM (USA); Mission Research Corp., Albuquerque, NM (USA); Air Force Weapons Lab., Kirtland AFB, NM (USA)). 1981. Contract AC04-76DP00789. 3p. (CONF-810314—21). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The transverse Beam Breakup Instability (BBI) can result in reduced pulse length in linear accelerators. A brief summary of the instability mechanism and a gain formula are presented. Test bench measurements of the two relevant parameters, transverse shunt impedance Z_1, and cavity Q have been made. These measurements illustrate the importance of transmission line dielectric and cavity geometry to the gain. Results indicate that Q may vary from 10 to 75, and that Z_1/Q is in the range 4 to 70 Ω.

15989 (SAND—81-0694C) Experiments on the acceleration and transport of multi-kiloampere ion beams. Lockner, T.R.; Humphries, S. Jr.; Ramirez, J.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 3p. (CONF-810314—38). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The Pulselac C accelerator is being constructed to study the properties of space-charge-neutralized ion beams and to demonstrate the feasibility of controlling high ion fluxes. A gas-injection plasma gun has been developed which can supply over 50 A/cm^2 of N^+ or other intermediate mass ions. This source supplies ion flux for the magnetically insulated extraction gap. The source and extractor produce a 100 kV, 5 kA annular ion beam which propagates into a diagnostic region. Diagnostics, including a Thompson parabola mass spectrometer, a magnetic spectrometer, magnetically insulated detectors, and biased charge collectors, have proven the purity and uniformity of the beam and have given preliminary information on its propagation characteristics. Further experiments

on the injector will include focusing using a toroidal lens and studies of beam aiming from the extractor gap. Two inductive post-acceleration stages, presently under construction, will increase the beam energy by 500 keV.

15990 (UCRL—85049) Measurement of asymmetric flux in the gap of an induction accelerator module. North, G.G. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 10p. (CONF-810314—44). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A unique transverse field probe is used to determine the effect of feed and load current asymmetries on the axial magnetic field symmetry in the acceleration gap of a linear induction accelerator module. The special probe was used to quantitatively measure transverse pulse magnetic fields down to one gauss in the presence of large common mode noise signals and 10^7V/M pulse electric fields. Module tests using the probe provided a direct measure of the asymmetric fields produced when unbalanced conditions occurred. It also verified that under normal balanced operation the on-axis transverse-field is less than one gauss.

15991 (UCRL—85074) Beam optics in the FXR 1.5 MeV, 4 kA injector. Scarpetti, R.D.; Kuenning, R.W.; Wong, K.C. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 4p. (CONF-810314—54). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The 20 MeV, 4 kA linear induction accelerator (FXR), currently under construction at LLNL, will use a cold cathode injector. The foil cathode consists of a 0.03 mm tantalum ribbon wound in a spiral with successive turns spaced 0.8 mm apart. The emitted current will be 15 to 20 kA but will be reduced to 4 kA by collimating immediately beyond the anode. This will minimize the beam emittance and maintain a good impedance match with the low impedance driving source. Computer simulation was used extensively to optimize the configuration of the beam forming electrodes, the emitter geometry, and the overall focusing and beam transport system in the injector region. This paper will discuss the approach used and the problems encountered in the design of the diode geometry and of the overall beam optics. Preliminary experimental results will be presented and will be compared with the computer model predictions.

15992 (UCRL—85650) Beam dynamics in the ETA and ATA 10 kA linear induction accelerators: observations and issues. Briggs, R.J.; Birx, D.L.; Caporaso, G.J.; Fessenden, T.J.; Hester, R.E.; Melendez, R.; Neil, V.K.; Paul, A.C.; Struve, K.W. (Lawrence Livermore National Lab., CA (USA)). 6 Mar 1981. Contract W-7405-ENG-48. 6p. (CONF-810314—19). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The 10 kA ETA and ATA linear induction accelerators are described. Beam instability is the major concern in these high current machines, and the current status of theoretical understanding, and experimental investigations with the 8 cavity ETA, are reviewed. Modifications to the induction cavities are described that have essentially eliminated the transverse resonant modes seen in the ETA.

15993 Means and method for the focusing and acceleration of parallel beams of charged particles. Maschke, A.W. (to Dept. of Energy). US Patent Application 152,461. 23 May 1980. 32p.

A novel apparatus and method for focussing beams of charged particles comprising planar arrays of electrostatic quadrupoles. The quadrupole arrays may comprise electrodes which are shared by two or more quadrupoles. Such quadrupole arrays are particularly adapted to providing strong focussing forces for high current, high brightness, beams of charged particles, said beams further comprising a plurality of parallel beams, or beamlets, each such beamlet being focussed by one quadrupole of the array. Such arrays may be incorporated in various devices wherein beams of charged particles are accelerated or transported, such as linear accelerators, klystron tubes, beam transport lines, etc.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 16272, 16274

15994 (BNL—29051) Lifetime of titanium filament at constant current. Chou, T.S.; Lanni, C. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 4p. (CONF-810314—23). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Titanium Sublimation Pump (TSP) represents the most efficient and the least expensive method to produce Ultra High Vacuum (UHV) in storage rings. In ISABELLE, a proton storage accelerator under construction at Brookhaven National Laboratory, for example, TSP provides a pumping speed for hydrogen of $> 2 \times 10^6$ l/s. Due to the finite life of titanium filaments, new filaments have to be switched in before the end of filament burn out, to ensure smooth operation of the accelerator. Therefore, several operational modes that can be used to activate the TSP were studied. The constant current mode is a convenient way of maintaining constant evaporating rate by increasing the power input while the filament diameter decreases as titanium evaporates. The filaments used in this experiment were standard Varian 916-0024 filaments made of Ti 85%, Mo 15% alloy. During their lifetime at a constant current of 48 amperes, the evaporation rate rose to a maximum at about 10% of their life and then flattened out to a constant value, 0.25 g/hr. The maximum evaporation rate occurs coincidently with the recrystallization of 74% Ti 26% Mo^2 from microstructure crystalline at higher titanium concentration to macrostructure crystalline at lower titanium concentration. As the macrocrystal grows, the slip plane develops at the grain boundary resulting in high resistance at the slip plane which will eventually cause the filament burn out due to local heating.

15995 (BNL—29175) Studies of quench propagation in a superconducting window frame magnet. Allinger, J.; Carroll, A.; Danby, G.; DeVito, B.; Jackson, J.; Leonhardt, M.; Prodell, A.; Stoehr, R. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—41). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

During the testing of a meter long, superconducting window frame magnet, information from many spontaneously generated quenches have been recorded by an on-line computer system. Nearly every layer in an eleven layer dipole had a voltage tap and for some layers this subdivided into two halves. This allowed us to study development of the quenches in some detail. Knowledge of the resistances throughout the magnet also allowed the temperature distributions in the superconducting windings to be determined. A qualitative picture of the quench was developed and quantitative values of quench propagation velocities were compared to heat transfer calculations.

15996 (BNL—29184) Negative ion source tests for H^- injection at the Brookhaven AGS. Barton, D.S.; Witkover, R.L. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—40). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A magnetron ion source of Fermilab design has been adapted to provide an H^- beam of 40 mA for acceleration in the Brookhaven 200 MeV Linac and injection into the AGS. The source operates at a repetition rate of 5 Hz and produces pulses of up to 250 μsec duration. Source stability, beam current and emittance have been studied as a function of several external source parameters. Beam emittance has been measured for two values of field gradient in the combined function magnet following the source. Evidence of neutralization of the space charge potential of the H^- beam has been noted. In the focusing plane the emittance was smaller by a factor of 2 for the higher magnet gradient.

15997 **(BNL—29233) Extraction for ISABELLE.** Claus, J.; Foelsche, H. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—59). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The design specifications for ISABELLE, a superconducting proton storage ring facility under construction at Brookhaven National Laboratory call for circulating beam intensities of up to 6 x 10^{14} protons at 400 GeV energy in each ring. The energy stored in the beam is 41 Megajoules, an order of magnitude more than what has been dealt with in the past. This beam energy cannot be safely disposed of within the confines of the ISABELLE lattice if damage to the dump or quenching of the superconducting magnets is to be avoided. Therefore the full intensity beam must be extracted from the storage rings under all circumstances of emergency or routine beam disposal. Beam losses in excess of 10^{-3} of the full beam can jeoardize the extraction components and lead to magnet quenching as well. In this note a conceptual design of the extraction system is summarized and the major constraints which lead to the parameters chosen are discussed.

15998 **(BNL—29235) Cryogenic systems for large superconducting accelerators/storage rings.** Brown, D.P. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—56). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Particle accelerators and storage rings which utilize superconducting magnets have presented cryogenic system designers, as well as magnet designers, with many new challenges. When such accelerators were first proposed, little operational experience existed to guide the design. Two superconducting accelerators, complete with cryogenic systems, have been designed and are now under construction. These are the Fermilab Doubler Project and the Brookhaven National Laboratory ISABELLE Project. The cryogenic systems which developed at these two laboratories share many common characteristics, especially as compared to earlier cryogenic systems. Because of this commonality, these characteristics can be reasonably taken as also being representative of future systems. There are other areas in which the two systems are dissimilar. In those areas, it is not possible to state which, if either, will be chosen by future designers. Some of the design parameters for the two systems are given.

15999 **(BNL—29239) Process control for the ISABELLE system.** Frankel, R.; Herman, A.; Stattel, P.; Warkentien, R. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 4p. (CONF-810314—36). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A low cost, highly reliable control system has been developed for use in the radiation environment of the ISABELLE ring. The Ultra-High Vacuum installation will consist of approximately 1500 stations - each having 8 readbacks, 4 on-off operations and 4 special functions - distributed over 2.5 mills. The paper will describe a multidrop party line system in which a μp based controller located in a protected environment communicates with up to 25 vacuum stations. All the μp controllers will be linked via the ISABELLE data highway. Mechanical, electronic and software aspects of the system are discussed and performance data from our First Cell model are presented.

16000 **(BNL—29240) Effect of a spectrometer magnet on the beam-beam interaction.** Cornacchia, M.; Parzen, G. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—58). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The presence of experimental apparatus in the interaction regions of an intersecting beam accelerator changes the configuration of the crossing beams. This changes the space-charge forces with respect to the standard, magnet-free crossing. The question is: what is the maximum allowable perturbation caused by the spectrometer magnet that can be tolerated from the point of view of the beam dynamics. This paper is limited to the perturbations that the curved trajectories cause the beam-beam space charge nonlinearities. The question has arisen of how one defines the strength of the perturbation. The only solution is to compute the strength of the most important nonlinear resources. In what follows, the computational method used in calculating these resonances is described, and compared with those induced by random orbit errors.

16001 **(BNL—29251) ISABELLE accelerator software, control system, and beam diagnostic philosophy.** Cornacchia, M.; Humphrey, J.W.; Niederer, J.; Poole, J.H. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—63). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The ISABELLE Project combines two large proton accelerators with two storage rings in the same facility using superconducting magnet technology. This combination leads to severe constraints on beam loss in magnets and involves complex treatment of magnetic field imperfections and correction elements. The consequent demands placed upon beam diagnostics, accelerator model programs, and the computer oriented control system are discussed in terms of an illustrative operation scenario.

16002 **(CONF-810314—37) Oak Ridge 25-MV tandem accelerator.** Ziegler, N.F.; Richardson, E.G.; Mann, J.E.; Juras, R.C.; Jones, C.M.; Biggerstaff, J.A.; Benjamin, J.A. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A new heavy-ion accelerator facility is nearing completion at the Oak Ridge National Laboratory. This paper presents a brief description of the scope and status of this project and a discussion of some aspects of the first operational experience with the 25 MV tandem accelerator which is being provided by the National Electrostatics Corporation (NEC) as a major component of the first phase of the facility.

16003 **(CONF-810314—45) Rapidly pulsed synchrotron for heavy-ion acceleration.** Welton, T.A. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The electron beam ion source (EBIS) offers an attractive basis for a high energy, high intensity, heavy-ion accelerating system. The conceptual design here reported has assumed that EBIS injects pulses into a fixed frequency cyclotron, with k = 200 for uranium ions. These pulses are then to be extracted and injected into a pulsed alternating-gradient ring. Clearly, a very large premium is thereby placed on achieving a high pulse rate. The magnetic field of the synchrotron can certainly be pulsed at 60 Hz, for example, but the problem of supplying an adequate rf voltage with the appropriate frequency swing has been a difficult one. We have assumed a pulsed beam of U^{+64} ions, supplied by EBIS at a convention low voltage. This beam is then accelerated to an energy of 14.46 MeV/amu by the K-200 cyclotron. This energy corresponds to a v/c value β/sub i/ = 0.17427, which we assume to be multiplied by a factor of 3 during the acceleration, so that β/sub f/ = 0.52280 and E/sub f//A = 161 MeV/amu. The synchrotron can be rather easily sized from these few numbers, together with an assumed maximum flux density of 1.5 Tesla. Convenient values for ν/sub x/ and ν/sub y/ will be 4.25 with essentially a FODO quadrupole arrangement, and the mean radius of the ring is 15.7 meters. Multiturn injection (25 turns) would be used to reach the space charge limit at injection, with x-y painting adequate to achieve this.

16004 **(LA-UR—81-684) New stringer for the LAMPF radiation effects facility.** Brown, R.D.; Hansen, C.F. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-26. 4p. (CONF-810314—43). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

New stringer design, allowing access to the spallation neutron flux at the Clinton P. Anderson Meson Physics Facility (LAMPF) beam stop is described, together with information on the neutron spectrum.

16005 **(LA-UR—81-685) Water-cooled pyrolytic graphite targets at LAMPF: design and operation.** Brown, R.D.; Grisham, D.L. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—42). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Design considerations and actual operating experience are reported for water-cooled pyrolytic graphite targets at the Clinton P. Anderson Meson Physics Facility (LAMPF). Emphasis is placed on the use of finite element computer calculations to determine target temperatures and stresses, which can then be evaluated to judge the usefulness of a particular design. Consideration is also given to the swelling of the target following irradiation, and to the measures taken to prolong target lifetime.

16006 **(LA-UR—81-719) Water-cooled beam line components at LAMPF.** Grisham, D.L.; Lambert, J.E. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—48). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The beam line components that comprise the main experimental beam at the Clinton P. Anderson Meson Physics Facility (LAMPF) have been operating since February 1976. This paper will define the functions of the primary water-cooled elements, their design evolution, and our operating experience to the present time.

16007 **(LA-UR—81-720) Monitor 1981.** Grisham, D.L.; Lambert, J.E.; Baldwin, T.S.; Ekberg, E.L. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—42). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The experimental proton beam line at the Clinton P. Anderson Meson Physics Facility (LAMPF) is maintained remotely (because of high radiation levels) by a specially designed remote handling system called Monitor. The prototype Monitor unit was placed in service in 1976 to repair highly activated components in the LAMPF beam stop. Since that time, the Monitor system has been continually improved to keep pace with more complex maintenance tasks and ever-increasing radiation levels in the experimental areas. To ensure that the facility can be maintained on a timely basis, a second Monitor unit was commissioned in 1980. The improvements in the Monitor system and components have increased the efficiency of LAMPF's remote-maintenance operations by a factor of two. The technology developed has advanced to the state where it can be directly applied to other applications or industries that may potentially compromise health and/or safety of workers.

16008 **(LA-UR—81-752) Voltage-breakdown testing for an RFQ structure.** Williams, S.W.; DePaula, R.F.; Keffeler, D.R.; Rodenz, G.R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—49). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Designs for Radio Frequency Quadrupole (RFQ) accelerators of reasonable length require operation with surface fields above the threshold of Kilpatrick's Sparking Criterion. A cavity was designed using SUPERFISH to test the validity of this criterion and to determine operating limits for the Los Alamos Proof-of-Princple (POP) RFQ. The testing was done near 420 MHz, with varying qualities of surface finish on the electrodes. The experimental set-up and procedure are described, as are the data and results. A method of calibrating the test is presented.

16009 **(LA-UR—81-753) Experimental investigation of heating phenomena in linac mechanical interfaces due to RF field penetration.** Fazio, M.V.; Reid, D.W.; Potter, J.M. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—50). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

In a high duty-factor, high-current, drift-tube linear accelerator, a critical interface exists between the drift-tube stem and the tank wall. This interface must provide vacuum integrity and RF continuity, while simultaneously allowing alignment flexibility. Because of past difficulties with RF heating of vacuum bellows and RF joints encountered by others, a paucity of available information, and the high reliability requirement for the Fusion Materials Irradiation Test (FMIT) accelerator, a program was initiated to study the problem. Because RF heating is the common failure mode, an attempt was made to find a correlation between the drift-tube-stem/linac-tank interface geometry and RF field penetration from the tank into the interface region. Experiments were performed at 80 MHz on an RF structure designed to simulate the conditions to which a drift-tube stem and vacuum bellows are exposed in a drift-tube linac. Additional testing was performed on a 367-MHz model of the FMIT prototype drift-tube linac. Experimental results, and a method to predict excessive RF heating, is presented. An experimentally tested solution to the problem is discussed.

16010 **(LA-UR—81-756) Vane fabrication for the proof-of-principle radio-frequency quadrupole accelerator.** Williams, S.W.; Potter, J.M. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—51). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The electrodes for the Proof-of-Principle (POP) Radio-Frequency Quadrupole (RFQ) accelerator were machined on a numerically controlled, three-axis, vertical mill. These pole tips, or vanes, were prepared for, and used, in the successful demonstration of RFQ practicality at Los Alamos National Laboratory in February 1980. The data set that described the vanes contained about 10 million bits of tool position data. The vanes were cut from OFHC copper blanks. The tolerances achieved were approximately +- 0.005 cm. The design and manufacturing procedures are described.

16011 **(LA-UR—81-757) 360° digital phase detector with 100-kHz bandwidth.** Reid, D.W.; Riggin, D.; Fazio, M.V.; Biddle, R.S.; Patton, R.D.; Jackson, H.A. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 3p. (CONF-810314—52). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The general availability of digital circuit components with propagation delay times of a few nanoseconds makes a digital phase detector with good bandwidth feasible. Such a circuit has a distinct advantage over its analog counterpart because of its linearity over wide range of phase shift. A phase detector that is being built at Los Alamos National Laboratory for the Fusion Materials Irradiation Test (FMIT) project is described. The specifications are 100-kHz bandwidth, linearity of +- 1° over +- 180° of phase shift, and 0.66° resolution. To date, the circuit has achieved the bandwidth and resolution. The linearity is approximately +- 3° over +- 180° phase shift.

16012 **(LA-UR—81-766) Long-pulse applications of pulse-forming lines for high-power linac application.** Hoeberling, R.F.; Tallerico, P.J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—32). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The ever present demands for high efficiency in the RF power stations for particle accelerators have caused increased interest in longer RF pulses (ten's of microseconds) for linacs such as the Pion Generator for Medical Irradiation (PIGMI) and Free Electron Laser (FEL). For either RF power station, a fundamental decision is whether to use a modulating anode/hard-tube driver or pulsed cathode/line-type pulser configuration. The choices in the

extremes of low power for very long pulses or for very-high-power, short pulses are, respectively, a modulated anode/hard tube modulator and pulsed cathode/pulse forming line. However, the demarcation between these two extremes is not clearcut. The criteria (cost, flexibility performance, reliability, efficiency) that resulted in the RF station definition of these two specific systems will be described.

16013 **(LA-UR—81-768) Radio-frequency quadrupole: a new linear accelerator.** Stokes, R.H.; Wangler, T.P.; Crandall, K.R. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810314—33). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

In many Laboratories, great emphasis now is placed on the development of linear accelerators with very large ion currents. To achieve this goal, a primary concern must be the low-velocity part of the accelerator, where the current limit is determined and where most of the emittance growth occurs. The use of magnetic focusing, the conflicting requirements in the choice of linac frequency, and the limitations of high-voltage dc injectors, have tended to produce low-velocity designs that limit overall performance. The radio-frequency quadrupole (RFQ) linear accelerator, invented in the Soviet Union and developed at Los Alamos, offers an attractive solution to many of these low-velocity problems. In the RFQ, the use of RF electric fields for radial focusing, combined with special programming of the bunching, allows high-current dc beams to be captured and accelerated with only small beam loss and low radial emittance growth. Advantages of the RFQ linac include a low injection energy (20 to 50 keV for protons) and a final energy high enough so the beam can be further accelerated with high efficiency in a Wideroee or Alvarez linac. These properties have been confirmed at Los Alamos in a highly successful experimental test performed during the past year. The success of this test and the advances in RFQ design procedures have led to the adoption of this linac for a wide range of applications. The beam-dynamics parameters of three RFQ systems are described. These are the final design for the prototype test of the Fusion Materials Irradiation Test (FMIT) accelerator, the final design for the prototype test of the Pion Generator for Medical Irradiations (PIGMI), and an improved low-velocity linac for heavy ion fusion.

16014 **(LBL—12053) Ultrarelativistic heavy ions.** Pugh, H.G. (Lawrence Berkeley Lab., CA (USA)). Dec 1980. Contract W-7405-ENG-48. 19p. (CONF-8010161—1). NTIS, PC A02/MF A01.

From 14. Los Alamos Meson Physics Facility users group meeting; Los Alamos, NM, USA (27 Oct 1980).

Studies with ultrarelativistic heavy ions combine aspects of cosmic ray physics, particle physics, nuclear physics, astrophysics and cosmogenesis. The leading theoretical concerns are the behavior of matter at very high-energy density and flux, the general behavior of space time in collisions, relativistic nuclear theory, and quantum chromodynamics. The field has developed over a period of more than thirty years, since the first observation of heavy nuclei in cosmic rays and the major developments of understanding of high-energy collisions made by Fermi and Landau in the early fifties. In the late sixties the discovery of the parton content of nucleons was rapidly followed by a great extension of high-energy collision phenomenology at the CERN ISR and subsequent confirmation of the QCD theory. In parallel the study of p-nucleus and nucleus-nucleus collisions at very high energies, especially at the CERN PS, Fermilab and the Bevalac, and in cosmic rays demonstrated that studies involving the nucleus opened up a new dimension in studies of the hadronic interaction. It is now at a high level of interest on an international scale, with major new accelerators being proposed to dedicate to this kind of study.

16015 **(UCRL—85036) Experimental test accelerator (ETA) II.** Fessenden, T.J.; Atchison, W.L.; Birx, D.L. (Lawrence Livermore National Lab., CA (USA)). 6 Mar 1981. Contract W-7405-ENG-48. 5p. (CONF-810314—20). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The Experimental Test Accelerator (ETA) is designed to produce a 10 kAmp electron beam at an energy of 4.5 MeV in 40 nsec pulses at an average rate of 2 pps. The accelerator also operates in bursts of 5 pulses spaced by as little as one millisec at an average rate of 5 pps. The machine is currently operating near 80% of its design values and has accumulated over 2.5 million pulses - mostly at a rate of one pps. The plasma cathode electron source, the remainder of the accelerator, and the operating characteristics of the machine are discussed.

16016 **Klystron-linac combination.** Stein, W.E. (to Dept. of Energy). US Patent Application 143,250. 24 Apr 1980. 25p.

A combination klystron-linear accelerator which utilizes anti-bunch electrons generated in the klystron section as a source of electrons to be accelerated in the accelerator section. Electron beam current is controlled by second harmonic bunching, constrictor aperture size and magnetic focusing. Rf coupling is achieved by internal and external coupling.

4304 Storage Rings

REFER ALSO TO CITATION(S) 15980, 15981

16017 **National Synchrotron Light Source basic design and project status.** Van Steenbergen, A. (Brookhaven National Lab., Upton, NY (USA)). *Nuclear Instruments amp Methods ;* **172**: No. 1/2, 25-32(May 1980).

From National conference on synchrotron radiation instrumentation; Gaithersburg, MD (4 - 6 Jun 1979).

A summary description and the basic design parameters of the National Synchrotron Light Source, a facility for the generation of intense synchrotron radiation in the Vuv and x-ray range is presented, the parameters of the sources are given, the presently planned facility beam lines are tabulated and the status of the project is indicated.

16018 **(BNL—28181) Design of a 6 Tesla wiggler for the National Synchrotron Light Source.** Hsieh, H.; Krinsky, S.; Luccio, A.; van Steenbergen, A. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—34). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A 6-pole, 6 Tesla wiggler with Nb-Ti superconducting windings has been designed, to be installed in a straight section of the 2.5 GeV x-ray storage ring of the NSLS. The technical problems of this magnet are discussed, in particular the optimization of the two-layer magnetic windings and the mechanical structure designed to counteract the strong magnetic forces. The effects of the insertion of the wiggler in the storage ring lattice are also studied.

16019 **(BNL—28945) National Synchrotron Light Source (NSLS): an optimized source for synchrotron radiation.** Hastings, J.B. (Brookhaven National Lab., Upton, NY (USA)). 1979. Contract AC02-76CH00016. 7p. (CONF-7911139—2). NTIS, PC A02/MF A01.

From Applications of EXAFS to materials science conference; Boston, MA, USA (26 Nov 1979).

Some of the considerations for an optimal design of a storage ring are outlined and the choices of parameters for the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory (BNL) are presented. Also the policy for utilization of NSLS beam lines is described for both the 0.7 GeV (VUV) storage ring and the 2.5 GeV (X-ray) storage ring.

16020 **(BNL—29050) Method of measuring and calculating the longitudinal microwave coupling impedance of ISABELLE.** Giordano, S.; Votruba, J. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—22). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Modes above the cutoff frequency of the ISABELLE vacuum chamber have been investigated to ascertain the micro-

wave longitudinal coupling impedance. (The investigation is limited to those modes that have fields in the beam pipes.) Perturbation measurements of the electric fields were made between 2.6 and 2.8 GHz. A phenomenological method of calculating these impedances was developed. There was excellent agreement between the calculated and measured impedance. The theoretical results were then extrapolated to 5.5 GHz.

16021 **(BNL—29216) Theoretical treatment of transverse feedback systems with memory.** Cornacchia, M.; Wang, J.M. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—47). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The differential equation of the dipole moment of coherent oscillations in the presence of a feedback system is derived. The analysis, which starts in the time domain, is extended to the frequency domain; this allows a straightforward derivation of the damping rate for both coasting and bunched beams. The damping rate is expressed in terms of the transfer function of the feedback system and in a general form which takes into account the β-function and betatron phase modulation along the beam trajectory, the effect of memory arising from the finiteness of the system bandwidth, the effect of the time delay and of the betatron phase advance between detector and kicker. Some examples of the dependence of the damping rate on the feedback parameters are given.

16022 **(BNL—29252) Quench propagation and training in simulated superconducting magnet windings.** Sampson, W.B.; Garber, M.; Ghosh, A. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 3p. (CONF-810314—55). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Training behavior similar to that which occurs in full scale superconducting accelerator magnets has been observed in small test windings. The test coils are formed from approximately 20 meters of conductor wound non-inductively, in Bifilar fashion. The resulting racetrack shaped coil is molded at elevated temperature to simulate the construction techniques used for the ISABELLE dipoles. The quench current of such windings has been measured as a function of applied field and the effect of parameters such as mechanical loading and porosity have been investigated. The velocity of propagation of the normal front has been measured both along and transverse to the direction of current flow for several test windings. The minimum energy required to produce a self propagating normal zone has also been determined in an attempt to quantify the relative stability of the coils.

16023 **Undulator for the 700 MeV Vuv-Ring of the National Synchrotron Light Source.** Krinsky, S. (Brookhaven National Lab., Upton, NY (USA). National Synchroton Light Source). *Nuclear Instruments amp Methods ;* **172**: No. 1/2, 73-76(May 1980).

From National conference on synchrotron radiation instrumentation; Gaithersburg, MD (4 - 6 Jun 1979).

The magnet parameters and the spectrum of the emitted radiation are considered for an undulator to be used in the Vuv-Rung of the NSLS.

16024 **Current schemes for National Synchrotron Light Source uv beamlines.** Williams, G.P.; Howells, M.R.; McKinney, W.R. (Brookhaven National Lab., Upton, NY (USA). National Synchroton Light Source). *Nuclear Instruments amp Methods ;* **172**: No. 1/2, 379-385(May 1980).

From National conference on synchrotron radiation instrumentation; Gaithersburg, MD (4 - 6 Jun 1979).

We describe in some detail four beamlines proposed for the National Synchrotron Light Source uv ring at Brookhaven National Laboratory. Three grazing incidence instruments, one of the plane grating Mijake type and two with toroidal gratings at grazing angles of $2\frac{1}{2}^{\circ}$ and 15°, are described. Two normal incidence instruments, one using the source as entrance slit and accepting 75 mrad horizontally, are also discussed. In each case we have estimated the output fluxes expected from such beamlines.

16025 **Beam line instrumentation proposed by an ORAU/ORNL consortium for the Vuv ring at NSLS.** Callcott, T.A. (Tennessee Univ., Knoxville (USA)); Carlson, P.A. (Oak Ridge National Lab., TN (USA)). *Nuclear Instruments amp Methods ;* **172**: No. 1/2, 386(May 1980).

From National conference on synchrotron radiation instrumentation; Gaithersburg, MD (4 - 6 Jun 1979).

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 15812, 15912, 16272, 16329

16026 **(DOE/ER/10550—1) CCNY collaboration with BNL in R and D for ISABELLE detectors. Technical progress report, September 1, 1979 to October 31, 1980.** Lindenbaum, S.J. (City Coll., New York (USA). Dept. of Physics). 1980. Contract AC02-79ER10550. 5p. NTIS, PC A02/MF A01.

The difference in ionization loss of particles as a function of their velocity is widely used as a technique to identify the particles. The ionization loss in gas samples an order of magnitude smaller than previously investigated was studied. In order to do this, new techniques were developed which use a longitudinal drift ionization detector and fast analog to digital conversion techniques which allows a piece of track to be sliced into very small samples by electronic means. This technique can substantially improve the mass resolution capability of gas particle detectors. It is also shown that only a rather coarse analog to digital converter (ADC) resolution is required to capture all the information needed with the truncated mean sampling method we employ to determine the relative energy loss. These new developments can substantially increase the sensitivity of particle separation by ionization measurements via gas particle detectors.

16027 (PNL—3700(Pt.4), pp 79-90) **Radiation instrumentation: radiological chemistry.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

During the past year, major efforts in this program have concentrated on lowering the background for the measurement of small amounts of radioactivity by beta and gamma counting, on the design of specialized systems, on specific procedures for the measurement of certain radionuclides, on improved computer programs for the analysis of gamma-ray spectral data, and on the development of x-ray fluorescence techniques that permit concentrations to be measured without the weight of the sample being known.

16028 (PNL—3700(Pt.4), pp 131-134) **Environmental pollutant characterization by Direct-Inlet Mass Spectrometry.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

The utility of direct-inlet mass spectrometry (DIMS) for the detection, characterization and monitoring of toxic airborne particulate pollutants is being experimentally determined. The response of the entire DIMS to artificially generated aerosols of $CsNO_3$ has been characterized as a function of surface ionization filament temperature and particle size.

16029 (PNL—3700(Pt.4), pp 135-137) **Trace analysis by laser excitation.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

This program is designed to research methods of trace analysis using lasers. The principal thrust has been to explore techniques using resonance ionization in the detection of atomic and molecular species. Among the accomplishments in the past year are the development of a technique that reduces the laser power requirements for resonance ionization experiments, the first demonstration of isotopically selective excitation of noble gases from the ground state,

and initial development of a simple field instrument for the detection of airborne aromatic hydrocarbons.

16030 Self-regulating neutron coincidence counter. Baron, N. (to Dept. of Energy). US Patent Application 159,895. 16 Jun 1980. 40p.

A device for accurately measuring the mass of ^{240}Pu and ^{239}Pu in a sample having arbitrary moderation and mixed with various contaminants. The device utilizes a thermal neutron well counter which has two concentric rings of neutron detectors separated by a moderating material surrounding the well. Neutron spectroscopic information derived by the two rings of detectors is used to measure the quantity of ^{239}Pu and ^{240}Pu in device which corrects for background radiation, deadtime losses of the detector and electronics and various other constants of the system.

16031 Multianode cylindrical proportional counter for high count rates. Hanson, J.A.; Kopp, M.K. (to Dept. of Energy). US Patent Application 152,954. 23 May 1980. 12p.

A cylindrical, multiple-anode proportional counter is provided for counting of low-energy photons (< 60 keV) at count rates of greater than 10^5 counts/sec. A gas-filled proportional counter cylinder forming an outer cathode is provided with a central coaxially disposed inner cathode and a plurality of anode wires disposed in a cylindrical array in coaxial alignment with and between the inner and outer cathodes to form a virtual cylindrical anode coaxial with the inner and outer cathodes. The virtual cylindrical anode configuration improves the electron drift velocity by providing a more uniform field strength throughout the counter gas volume, thus decreasing the electron collection time following the detection of an ionizing event. This avoids pulse pile-up and coincidence losses at these high count rates. Conventional RC position encoding detection circuitry may be employed to extract the spatial information from the counter anodes.

16032 Compensated count-rate circuit for radiation survey meter. Todd, R.A. (to Dept. of Energy). US Patent Application 148,862. 12 May 1980. 15p.

A count-rate compensating circuit is provided which may be used in a portable Geiger-Mueller (G-M) survey meter to ideally compensate for couting loss errors in the G-M tube detector. In a G-M survey meter, wherein the pulse rate from the G-M tube is converted into a pulse rate current applied to a current meter calibrated to indicate dose rate, the compensation circuit generates and controls a reference voltage in response to the rate of pulses from the detector. This reference voltage is gated to the current-generating circuit at a rate identical to the rate of pulses coming from the detector so that the current flowing through the meter is varied in accordance with both the frequency and amplitude of the reference voltage pulses applied thereto so that the count rate is compensated ideally to indicate a true count rate within 1% up to a 50% duty cycle for the detector. A positive feedback circuit is used to control the reference voltage so that the meter output tracks true count rate indicative of the radiation dose rate.

16033 (ANL-Trans—1194) Neutron time-of-flight diffractometer with a linear-position sensitive detector. Balagurov, A.M.; Gordelii, V.I.; Ishmukhametov, M.E.; Novozhilov, V.E.; Ostanevich, Yu.M.; Savenko, B.I.; Shibaev, V.D. (Argonne National Lab., IL (USA)). 1980. Translation of JINR—P13-80-440, 1980. 18p. NTIS, PC A02/MF A01.

A method for recording two-dimensional neutron diffraction patterns as a function of the scattering angle and the wavelength of the diffracted neutrons is described, and its results have been examined on a pulsed neutron source, the IBR-30 reactor. The position sensitive detector is composed of an SNM-41 (7 atmosphere helium-3) proportional counter in which high resistance nichrome wire is used as the anode. The determination of the coordinates of the neutron event in the detector is performed using two analog-to-digital converters which analyze the amplitudes of the pulses at each end of the anode wire, and with a special device (a dedicated processor) which includes a scheme for division using digital arithmetic. Tests performed on the IBR-30 reactor have shown that two-dimensional neutron diffraction data shorten the duration of the experiment (by about 20 times) and improve the quality of the diffraction patterns.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

16034 (SAND—81-0298) Results of deep water acoustic telemetry development tests. Ryerson, D.E.; Reece, E.W. (Sandia National Labs., Albuquerque, NM (USA)). 10 Feb 1981. Contract AC04-76DP00789. 31p. NTIS, PC A03/MF A01.

Acoustic telemetry provides wireless communications between seafloor instrumentation systems and shipboard receiving equipment. Sandia Laboratories' high data rate acoustic telemetry system had been previously demonstrated in water depths up to 200 meters. Analyses, laboratory tests, and field tests have been conducted which demonstrate that the range of the system can be extended to at least 500 meters. This report contains the results of these analyses and tests.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 15235, 15932

16035 (ANL-HEP-CP—80-74) Fast TDC for on-line TOF using monolithic flash A/D converter. Dawson, J.W.; Underwood, D. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. (CONF-801103—55). NTIS, PC A02/MF A01.

From IEEE nuclear science symposium; Orlando, FL, USA (5 Nov 1980).

A fast TDC has been developed for a polarization experiment at LASL using a flash A/D converter to digitize the time information. The TDC operates on a time interval in the region of 0 to 5 ns producing an output in one of 16 bins. The 16 time bins are logically OR'ed into 8 channels, which may be used as components of a trigger. The system resets itself and may be operated at rates to 15 Mc. Preliminary experimental results will be included.

16036 (BDX—613-2592) Standards for organic contaminant thickness measurement by the ellipsometer. Jackson, L.C. (Bendix Corp., Kansas City, MO (USA)). Mar 1981. Contract AC04-76DP00613. 13p. NTIS, PC A02/MF A01.

No film thickness standards have been established for the ellipsometer that can be used for determining the thickness of organic contaminants on electrical components. Thickness measurement of organic contamination on a surface is dependent on the refractive index of the film; knowledge of the refractive index of the film is required before thickness measurements can be made. Silicon oxide has a refractive index equivalent to most organic materials. Silicon oxide, therefore, can be used for developing thickness standards for use in ellipsometer measurement of organic film contamination. A film thickness standard curve was established by correlating known silicon oxide thicknesses with their corresponding phase change (delta, an optical constant of the surface). Thickness standards up to 2700 A were established.

16037 (PNL—3700(Pt.4), pp 91-92) Magnetic field dosimeter development. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

Magnetic field dosimeters have been developed to measure the exposure of personnel who work in magnetic field environments. The battery-operated devices use Hall-effect sensors and microprocessors for data analysis. In the operation of a magnetic field dosimeter data recording system the magnetic field exposure data (dose) is transferred from the dosimeter to a readout console for final analysis and storage. These instruments demonstrate the feasibility of monitoring personnel exposure in magnetic field environments.

16038 (PNL—3700(Pt.4), pp 139) Applications of holography. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

The nature and distribution of aerosols and particulate matter in the atmosphere and of particulates and microscopic-sized

organisms in water are of interest and concern in characterizing our environment. A hologram provides a static image of a selected volume of air or water at a chosen instant without disturbing the disposition of the particles in any way. Using this image, the position, size and shape of every particle in the volume can be individually determined. Semiautomatic methods of hologram image analysis have been developed to increase the speed and efficiency of determining size distributions, volume fractions, velocity distributions and shape factors.

16039 **Time delay multiplexing of optical spectra with a fiber optic array.** Whitten, W.B. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Analytical Chemistry ;* **52**: No. 14, 2355-2357(Dec 1980).

Fiber optic delay lines, a grating monochromator, a single photomultiplier, and time-correlated photon counting techniques are combined to make a 30-channel absorption spectrometer. The transit time delay in a series of optical fibers of different lengths permits the sequential arrival at the detector of the various wavelength components of a light pulse. While of restricted practicality because of the required low counting rate, the instrument suggests the feasibility of single pulse spectral measurements with a fiber optic multiplex spectrometer.

4404 Well Logging Instrumentation

REFER ALSO TO CITATION(S) 15343

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 15255

16040 **(UCRL-Trans—11659) Lecture F1: third international symposium on ballistics.** Hold, M. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Dec 1980. Translation source information not available . 17p. NTIS, PC A02/MF A01.

The characteristics of shaped charges, flat charges, and projectile-forming charges are described and compared. Literature on the subject is reviewed, and experimental data on the formation of projectiles by deformation of the liner during explosive charge detonation are presented. Projectile-forming charges were found to have much lower short-penetration capability as compared with shaped or flat charges. However, stronger aftereffects are always achieved with the penetration of such a projectile due to the large mass of the projectile and to the development of secondary fragments from the torn up target material. A multi-projectile-forming charge has the particular advantage of higher penetration capacity as compared with fragments from fragmentation warheads. (LCL)

16041 **Characterization of high explosives by observing growth to detonation.** Mohler, J.H.; Moodie, W.J.; Haws, L.D.; Hall, G.F. (Mound Facility, Miamisburg, OH). *Combustion and Flame ;* **32**: 285-294(1978).

Growth to detonation was observed in EBW-initiated PETN, using optical fibers and high-speed detection and recording equipment. The distance-time profiles generated have been found to fit the empirical equation $S = V/C \exp - C(t-t_0) + V(t-t_0\{) - V/C + S_0$, where S is distance, t is time, V,C,S_0 and t_0 are adjustable parameters which are descriptive of the profile. The integral of the accelerative portion of the distance-time curve was found to correlate with the EBW sensitivity of the samples.

4502 Nuclear

16042 **(AD-A—084641) Blast transport of debris from scale model buildings. Volume I, Chapters 1 through 5.** Witt, E.F. (Bell Telephone Labs., Inc., Whippany, NJ (USA)). 18 Jan 1979. 174p. NTIS, PC A08/MF A01.

These tests were conducted to simulate in small scale, 1/140 to 1/8, the flight and ground distributions of debris ripped from masonry and wooden buildings by nuclear blasts. Those simulated in these tests had peak overpressures of 10 to 35 psi from detonations of 0.1 to 12 megatons. Scaled up test results are that wood debris can be carried over 2,000 feet with the blast, can travel over 1,000 feet to the side, can be lofted over 300 feet into the air above the building and can attain as much as 0.7 of the peak air particle velocity. These bounds are correspondingly less for denser masonry debris. Such effects can be a serious hazard to blast resistant facilities and these tests were part of a study to define these debris hazards. In all, 125 scale buildings were exposed to test blasts from up to 500 tons of TNT. The scaling factor, model debris density, and location from the test blast were determined by a scaling theory specifically developed for these tests. These models were specially constructed of loose pieces which simulated masonry blocks, plywood panels, beams and rafters. Some models were placed in groupings with one model building width between models. Less debris was carried away from the interior model buildings than from models on the periphery or from models placed by themselves. Tests were conducted on level terrain except in Event DIAL PACK where 15 degree slopes were constructed. These had limited effects on debris travel and slopes cannot be used to protect vulnerable facilities.

16043 **(AD-A—084642) Blast transport of debris from scale model buildings. Volumes II, Appendices A-J.** Witt, E.F. (Bell Telephone Labs., Inc., Whippany, NJ (USA)). 18 Jan 1979. 348p. NTIS, PC A15/MF A01.

These tests were conducted to simulate in small scale, 1/140 to 1/8, the flight and ground distributions of debris ripped from masonry and wooden buildings by nuclear blasts. Those simulated in these tests had peak overpressures of 10 to 35 psi from detonations of 0.1 to 12 megatons. Scaled up test results are that wood debris can be carried over 2,000 feet with the blast, can travel over 1,000 feet to the side, can be lofted over 300 feet into the air above the building and can attain as much as 0.7 of the peak air particle velocity. These bounds are correspondingly less for denser masonry debris. Such effects can be a serious hazard to blast resistant facilities and these tests were part of a study to define these debris hazards. In all, 125 scale buildings were exposed to test blasts from up to 500 tons of TNT. The scaling factor, model debris density, and location from the test blast were determined by a scaling theory specifically developed for these tests. These models were specially constructed of loose pieces which simulated masonry blocks, plywood panels, beams and rafters. Some models were placed in groupings with one model building width between models. Less debris was carried away from the interior model buildings than from models on the periphery or from models placed by themselves. Tests were conducted on level terrain except in Event DIAL PACK where 15 degree slopes were constructed. These had limited effects on debris travel and slopes cannot be used to protect vulnerable facilities.

16044 **(AD-A—084643) MX MPS deployment, an on-site fallout evaluation. Final report 12 Jul-29 Dec 78.** Craver, R.H.; McGahan, J.T.; Muller, E. (Science Applications, Inc., McLean, VA (USA)). 29 Dec 1978. Contract DNA001-78-C-0350. 77p. NTIS, PC A05/MF A01.

This report addresses the probable extent and severity of the fallout hazard associated with a massive hypothetical attack against an MPS Deployment of the MX missile in the Nevada Model Area. It contains descriptions of attack scenarios, site modeling, methodology for calculating and depicting the distribution of fallout, and quantitative estimates of the severity of the hazard. Forty separate wind samples taken over a twelve-month period are used to assess the variability of the distribution of fallout resulting from an attack of several thousand surface burst weapons at the Nevada site. Fallout intensities are determined at 177 monitor points throughout the potential deployment area; time histories of dose rate buildup and decay are presented and discussed with respect to operational implications. Key factors are parameterized to permit comparison of a range of design factors and logistical considerations. Key findings are presented in condensed form including several illustrative examples chosen to quantify the practical aspects of operating in a radiation environment and to assist in the development of a balanced system design.

16045 **(AD-A—084648) Spherically symmetric numerical simulation of the SRI grout spheres containment experiments. Topical report 1 Jan-31 Oct 78.** Rimer, N.; Lie, K. (Systems, Science and Software, La Jolla, CA (USA)). 31 Oct 1978. Contract DNA001-77-C-0099. 46p. NTIS, PC A03/MF A01.

As part of the DNA stemming and containment program for underground nuclear testing, Stanford Research Institute is conducting laboratory investigations to develop a containment experiment for studying residual stress fields around an explosively generated cavity in a grout sphere. Here we present the S3 numerical simulations of the spherically symmetric aspects of these laboratory investigations. Calculations are presented which simulate the high explosive detonation and the subsequent dynamic processes which result in the formation of the compressive residual stress fields around the cavity. Results are presented showing our ability to simulate the detonation of the explosive charges in water and in grout. Preliminary results are shown for a calculational model which simulates the spherically symmetric venting and subsequent hydrofracture of the cavity.

16046 **(AD-A—084649) Evaluation of instrumentation. Final report 3 Oct 77-2 Oct 78.** Scott, L. (JAYCOR, Del Mar, CA (USA)). 31 Jan 1979. Contract DNA001-78-C-0005. 16p. NTIS, PC A02/MF A01.

This report contains a description of the recent activities of JAYCOR in the DNA program to evaluate instrumentation used in nuclear underground tests and other nuclear simulator experiments. Primarily this activity consisted of Dr. Larry Scott reviewing the instrumentation used by experimenters and recommending improvements. This activity is aimed at improving the quality of data from simulator and UGT experiments. Detailed technical discussions are found in other reports; an overview is presented here.

16047 **(AD-A—084652) Effects of pipe wall mass distribution in line-of-sight nuclear tests. Topical report Sep 77-Jul 78.** Rimer, N.; Wiehe, J.; Barthel, J. (Systems, Science and Software, La Jolla, CA (USA)). 1 Aug 1978. Contract DNA001-77-C-0099. 26p. NTIS, PC A03/MF A01.

The results of a continuing investigation into the possibility that the introduction of asymmetries into the horizontal line-of-sight pipe on a nuclear event may be able to reduce the flow of energetic materials down this pipe is presented here. In an attempt to model the three-dimensional asymmetric configurations, two-dimensional planar calculations were made in which the spiral wrap was approximated by alternating pieces of iron along the top and bottom of the pipe (channel). For the cases studied, it appears that increasing the amount of iron around the pipe reduces the energy of the jet and that this iron should be placed symmetrically about the pipe. However, the results indicated some deflection of the jet off axis in the spiral approximated.

16048 **(AD-A—084654) TRANAL user's guide, Part 1. (Small strain, small displacement version). Final report 1 Oct 75-31 Dec 78.** Baylor, J.L.; Wright, J.P.; Chung, C.F. (Weidlinger Associates, New York (USA)). 1 Mar 1979. Contract DNA001-76-C-0125. 147p. NTIS, PC A07/MF A01.

TRANAL (Transient nonlinear analysis) is a system of computer programs for doing nonlinear three-dimensional structure-medium interaction calculations. This report describes the small strain, small displacement version of TRANAL; the large strain, large displacement version is described in a separate report. Theoretical background, input data, program organization, graphics capability, data management and sample problems are discussed in sufficient detail that a new user should be able to set up and run a calculation. TRANAL is based on a finite element approach for the development of the discrete form of the equations of motion and an eight-moded isoparametric element is used to represent the continuum. Material behavior is represented by the cap model, which is based on classical elastic, nonideal plasticity theory with an associated flow rule. An explicit time integration scheme is used, and a special integration technique, called 'subcycling', permits the use of different size time steps in different elements, thereby reducing computation time considerably. Due to their complexity, transient nonlinear 3-D calculations generally require relatively large computational capability. Hence, this version of TRANAL has been written primarily for the CDC 7600 (although it is operational on several other CDC systems, including a 6600, a CYBER/175 and a CYBER/176, and could be transferred to other large computer systems).

16049 **(AD-A—084662) Laboratory investigation of containment in underground nuclear tests. Final report 1 Jan-30 Nov 77.** Cizek, J.C.; Florence, A.L. (SRI International, Menlo Park, CA (USA)). 1 Jan 1978. Contract DNA001-77-C-0025. 136p. NTIS, PC A07/MF A01.

As part of the DNA stemming and containment program for underground nuclear testing, laboratory investigations were conducted to further develop a containment experiment for studying residual stress fields around exploded cavities. A comparison of hydrofracture pressures for exploded and unexploded cavities revealed the existence of this stress field and its benefit to containment. Fundamental containment mechanisms were investigated by studying the effects of changes in basic experimental parameters. The data generated provide results suitable for development of new containment theories as well as for correlation with predictions of existing computer codes.

16050 **(AD-A—088511) Further evaluation of blast tests of an engine inlet. Final report 1 Apr 78-31 Mar 79.** Ruetenik, J.R.; Smiley, R.F.; Tomayko, M.A. (Kaman Avidyne, Burlington, MA (USA)). 31 Mar 1979. Contract DNA001-78-C-0239. 262p. NTIS, PC A12/MF A01.

A test program was conducted to simulate blast wave intercepts with a scaled aircraft engine in subsonic flight. Initial results were reported in DNA 4590F. This report presents additional test data and evaluated results. Jumps in total pressure at the engine face produced by blast interaction with the blastward and leeward inlets are evaluated with respect to effects of four test variables: inlet weight flow, Mach number, shock overpressure and intercept angle. The total pressure rose more rapidly in the blast inlet than the leeward inlet, following the blast intercept, and by a larger amount. In many tests the rise in the leeward inlet was followed by a rapid fall-off, indicating possible flow separation in the inlet walls. The two-dimensional Blast Induced Distortion (BID) code provides good representation of effects essentially two-dimensional and inviscid, such as ramp, cowl and engine-face pressures of the blastward inlet. Blast wave reflection from the engine is expected to be a potential cause of distortion through boundary-layer retardation. The effect on engine-face total pressure is examined with respect to the four test variable. Improved calculations of the effect of the engine-reflected blast wave on the boundary layers in the inlets, made using the generalized NASA-Lewis BLAYER code, indicate that the boundary-layer separation would result. (Author)

16051 **(AD-A—995023) Operation SNAPPER. Nevada Proving Grounds, April-June 1952. Project 6.5. Decontamination of aircraft. Report to the Test Director.** Teres, J. (USAEC, Washington, DC). Mar 1953. 66p. NTIS, PC A04/MF A01.

No abstract available.

16052 **(LA—8632) Ballistic missile defense: a potential arms-control initiative.** Barasch, G.E.; Kerr, D.M.; Kupperman, R.H.; Pollock, R.; Smith, H.A. (Los Alamos Scientific Lab., NM (USA)). Jan 1981. Contract W-7405-ENG-36. 25p. NTIS, PC A02/MF A01.

US strategic forces must be restructured to meet national-security objectives in a changing world. Growth and modernization of Soviet strategic missile forces are causing our land-based strategic missiles to become increasingly vulnerable to Soviet nuclear attack. For some strategic force configurations, the goals of flexible nuclear deterrence and strategic arms limitations appear mutually inconsistent. With such forces, prospects for arms limitations would degrade further if the current Soviet build-up were to continue, or if the Soviets were to install unilaterally an anti-ballistic missile system capable of wide-area, multicity defense, or both. However, if the US installs an anti-ballistic missile system along with reduced but modernized offensive strategic forces, arms limitation appears compatible with both assured destruction and war-fighting deterrence policies. This conclusion appears equally valid for expanded

Soviet forces even if the Soviets also install ballistic missile defenses. In particular, an American strategic posture including layered defense of MX missiles based deceptively in silos was analyzed. The exoatmospheric-intercept component of this defense system could also defend some of our cities and industrial and military installations. If the US were to adopt this strategic posture, we believe it would create incentives for the Soviet Union to restrain strategic-armsexpansion. Mutual arms-control initiatives could follow. Test and installation of the needed defensive systems are now precluded by the Anti-Ballistic-Missile Treaty adopted in 1972. An opportunity for Treaty reconsideration occurs in 1982. Substantiation of our results would suggest that consideration be given to Treaty modifications or to replacing the Treaty with other agreements.

4503 Explosion Detection

16053 **(AD-A—084118) Seismic discrimination of earthquakes and explosions, with application to the Southwestern United States. Technical report.** von Seggern, D.H.; Rivers, D.W. (Teledyne Geotech, Alexandria, VA (USA). Seismic Data Lab.). 22 Mar 1979. Contract F08606-78-C-0007,. 247p. NTIS, PC A11/MF A01.

This study examines seismic discrimination between underground nuclear explosions and earthquakes in the Southwestern United States. A thorough review of theoretical and applied research on this problem, especially as it relates to that region, is presented first, followed by a presentation of the seismic discrimination parameters computed for a suite of events in the Southwest and a series of experiments with multi-dimensional discrimination. Review of past work finds some theoretical support for successful discrimination based upon several distinct measurements on seismic recordings. Although negative first motion and presence of pP both indicate a natural earthquake source, they cannot be found confidently in many cases. The relative level of shear-wave and Love-wave phases should be a good classification parameter. The long-period P spectrum of explosions should be diminished due to the surface interaction and consequent cancellation by pP. The region under study extends from California to the southern Rocky Mountains and from roughly 40 degrees N to the Gulf of California. A region of high seismicity, it is also a complex region encompassing several tectonic provinces, including the Basin-Range Province where the Nevada Test Site is located. In general, seismic discriminant parameters obtained from the recordings reflected the theoretical expectations of earthquake-explosion differences. Path-station effects were large for every parameter, especially for short-period data.

16054 **(FOA-C—20275-T1) Seismological recordings of nuclear explosions in 1976 obtained at the Hagfors Observatory in Sweden.** Nedgard, I. (Foersvarets Forskningsanstalt, Stockholm (Sweden)). Nov 1978. 72p. Dep. NTIS (US Sales Only).

This report summarizes available source information on announced and presumed nuclear explosions in 1976, totally 41 of which 34 were registered by the Hagfors Observatory. It also presents short- and long-period seismic signals obtained from these explosions at the three substations of the Hagfors Observatory in Sweden, and normalized amplitude spectra calculated from these signals. 57 figures, 5 tables.

16055 **(SAND—81-0501C) Comparison of ground motion from earthquakes and underground nuclear weapons tests at NTS.** Vortman, L.J. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 17p. (CONF-810225—2). NTIS, PC A02/MF A01.

From Workshop on seismic performance of underground facilities; Augusta, GA, USA (11 Feb 1981).

On August 5, 1971, an earthquake occurred at Massachusetts Mountain on the Nevada Test Site. The depth was variously reported as 4 km and 4.6 km. The body wave magnitude, M/sub b/, was reported as 4.3, and the duration magnitude, M/sub d/, as 3.5. The ground motion caused by this event was compared with that caused by four underground nuclear events at NTS. (ACR)

16056 **(AD-A—084245) Differences between explosions and earthquakes.** Zhichen, C.; Chuanchen, Z.; Zuochun, H. Translated from *Acta Geophysica Sinica;* **18**: No. 3, 208-218(Mar 1980). 23p. NTIS, PC A02/MF A01.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

REFER ALSO TO CITATION(S) 16066, 16067, 16071, 16074

16057 **(DOE/EV/10281—2) Anthropogenic climate change: assessing the responsibility of developed and developing countries.** Schware, R.; Friedman, E. (Aspen Inst. for Humanistic Studies, Boulder, CO (USA); Mitre Corp., McLean, VA (USA)). 1980. Contract AC02-79EV10281. 8p. NTIS, PC A02/MF A01.

If the international community of nations is ever to assess responsibility for carbon dioxide production and changed distributions of climate, calculations must be extended backward and forward to encompass a range of reasonable scenarios of fossil fuel use and carbon dioxide emissions. The preliminary calculations presented here indicate that developed countries might have to bear the brunt of responsibility for new climatic regimes, as suppliers of fuel to the world, as major consumers, and as the major overall cumulative contributions of CO_2 to the atmosphere through the next century.

16058 **(DOE/EV/10281—7) Scenario of the impact of a future climate change on world food production.** Schware, R.; Kellogg, W.W. (National Center for Atmospheric Research, Boulder, CO (USA)). 1980. Contract AC02-79EV10281. 16p. NTIS, PC A02/MF A01.

In order to study implications of a future CO_2-induced climatic change, plausible long-term changes of patterns of temperature and rainfall must be devised. One such scenario is presented, showing regions that may be wetter or drier than now in a future warmer climate. This information was combined with data on world food productivity to show some crops that could be affected by climate-induced changes in soil moisture. Assumptions made when preparing the map of possible changes in soil moisture are discussed. (JGB)

16059 (PNL—3700(Pt.1), pp 57-65) **Aerosol technology development.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

Developed are techniques for generating and characterizing aerosols of energy-source-related-material and the design of inhalation exposure chambers used in health effects studies has been improved. Designs for rodent, nose-only, exposure chambers are being studied using a dynamically equivalent water-flow system in half-scale models. In addition, the dissolution rates of powdered americium dioxide in water and in simulated lung fluid have been measured.

16060 (PNL—3700(Pt.3), pp 1-14) **Atmospheric diffusion in complex terrain.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This paper focuses on defining and developing a long-range technical plan for studying the transport and diffusion of pollutant particles and gases over complex landforms and assisting a multilaboratory program studying diffusion in complex terrain by providing methodologies and techniques of analyses for transport and diffusion over a variety of complex landforms.

16061 (PNL—3700(Pt.3), pp 15-19) **Atmospheric boundary layer studies.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

These studies focus on investigating the meteorological characteristics of the planetary boundary layer that pertain to pollutant transport and dry removal, analyzing the transport and diffusion of pollutants in complex terrain, particularly in the Geysers Geothermal Area of California, and constructing simple models for the prediction of the depth, speed and direction of gravity-controlled drainage flows and pollutant dispersion within these flows.

16062 (PNL—3700(Pt.3), pp 111-112) **Arid Lands Ecology (ALE) climatology.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This paper summarizes the ten-year precipitation averages at the Arid Lands Ecology (ALE) reserve and correlates these data with elevation of the recording site. The average annual precipitation increases with elevation to about 700 m.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 15318, 15367, 15977, 16028, 16029

16063 **(ATDL—81/4) Environmental Research Laboratories annual report for 1979 and 1980.** (National Oceanic and Atmospheric Administration, Oak Ridge, TN (USA). Atmospheric Turbulence and Diffusion Lab.). Mar 1981. 67p. NTIS, PC A04/MF A01.

The Atmospheric Turbulence and Diffusion Laboratory (ATDL) research program is organized around the following subject areas: transport and diffusion over complex terrain, atmospheric turbulence and plume diffusion, and forest meteorology and climatological studies. Current research efforts involve experimental and numerical modeling studies of flow over rugged terrain, studies of transport of airborne material in and above a forest canopy, basic studies of atmospheric diffusion parameters for applications to environmental impact evaluation, plume rise studies, and scientific collaboration with personnel in DOE-funded installations, universities, and government agencies on meteorological studies in our area of expertise. Abstracts of fifty-two papers that have been published or are awaiting publication are included.

16064 **(BNL—29031) Acidic precipitation: considerations for an air-quality standard.** Evans, L.S.; Hendrey, G.R.; Stensland, G.J.; Johnson, D.W.; Francis, A.J. (Brookhaven National Lab., Upton, NY (USA); Manhattan Coll., New York (USA). Lab. for Plant Morphogenesis; Illinois State Water Survey, Urbana (USA); Oak Ridge National Lab., TN (USA)). 1980. Contract AC02-76CH00016. 48p. (CONF-8009137—1). NTIS, PC A03/MF A01.

From APCA conference on the proposed SO/sub x/ and particulate standards; Atlanta, GA, USA (16 Sep 1980).

Acidic precipitation, wet or frozen deposition with a hydrogen ion concentration greatern than 2.5 $\mu eq\ l^{-1}$ is a significant air pollution problem in the United States. The chief anions accounting for the hydrogen ions in rainfall are nitrate and sulfate. Agricultural systems are more likely to derive net nutritional benefits from increasing inputs of acidic rain than are forest systems when soils alone are considered. Agricultural soils may benefit because of the high N and S requirements of agricultural plants. Detrimental effects to forest soils may result if atmospheric H^+ inputs significantly add to or exceed H^+ production by soils. Acidification of fresh waters of southern Scandinavia, southwestern Scotland, southeastern Canada, and northeastern United States is caused by acid deposition. Areas of these regions in which this acidification occurs have in common, highly acidic precipitation with volume weighted mean annual H^+ concentrations of 25 $\mu eq\ l^{-1}$ or higher and slow weathering granitic or precambrian bedrock with thin soils deficient in minerals which would provide buffer capacity. Biological effects of acidification of fresh waters are detectable below pH 6.0. As lake and stream pH levels decrease below pH. 6.0, many species of plants, invertebrates, and vertebrates are progressively eliminated. Generally, fisheries are impacted below pH 5.0 and are completely destroyed below pH 4.8. There are few studies that document effects of acidic precipitation on terrestrial vegetation to establish an air quality standard. It must be demonstrated that current levels of precipitation acidity alone significantly injure terrestrial vegetation. In terms of documented damanges, current research indicates that establishing a standard for precipitation for the volume weighted annual H^+ concentration at 25 $\mu eq\ l^{-1}$ may protect the most sensitive areas from permanent lake acidification.

16065 **(LBL—12251) Nitrogen oxides controversy.** Johnston, H.S. (Lawrence Berkeley Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 35p. (CONF-810130—1). NTIS, PC A03/MF A01.

From American Association for the Advancement of Science symposium; Toronto, Ontario, Canada (8 Jan 1981).

With ten-year hindsight, the scientific considerations that entered discussions of possible changes of stratospheric ozone by large fleets of US-type SSTs are seen to be logical and constructive. Since 1961, it has been realized that the photochemistry of the natural ozone balance cannot be explained in terms of pure oxygen species (O/sub x/ = O, O_2, O_3), but that something else in the stratosphere destroys most of the ozone formed at and below the altitude of its maximum mixing ratio. When (1965-70) this natural ozone destruction was thought to be caused by a few ppM of water, it was pointed out that the predicted 10% increase in stratospheric water by SSts was a matter of concern. When (1970-71) it was found that a few ppB of nitrogen oxides (NO/sub x/ = NO, NO_2) probably are the major cause of natural ozone destruction, then it was pointed out that the predicted doubling of stratospheric NO/sub x/ by SSTs was a matter of concern. These were valid statements of the need for an environmental impact assessment. This area of science was primitive in 1970, but by 1981 it has a large body of laboratory and atmospheric measurements and elaborate mathematical models.

16066 **(PNL—3700(Pt.3)) Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.** Elderkin, C.E. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Feb 1981. Contract AC06-76RL01830. 147p. NTIS, PC A07/MF A01.

Separate absracts were prepared for the 15 sections of this progress report which is a description of atmospheric research at PNL organized in terms of the following energy technologies: coal, gas and oil; fission and fusion; and oil shale. (KRM)

16067 (PNL—3700(Pt.3), pp 21-35) **Radiative effects of clouds and aerosols.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This study focuses on measuring energy-related aerosol radiative properties and relating them to aerosol physical and chemical properties, measuring upwelling and downwelling short- and longwave radiation at various levels within the planetary boundary layer, determining radiative effects of clouds, particularly those that have been influenced by energy-related pollutants, and modeling radiative transfer in the planetary boundary layer using measured aerosol radiative properties and fluxes.

16068 (PNL—3700(Pt.3), pp 37-40) **Pollutant transformation in the atmosphere.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This paper measures chemical transformation rates of polycyclic aromatic hydrocarbons and other organic comounds emitted by fossil-fueled power plants, correlates transformation rates with distance from the source, ambient temperature, light intensity and concentrations of sulfur dioxide, nitrogen oxides, and ozone, and evaluates the results of laboratory studies on discrete reaction steps in the overall transformation processes.

16069 (PNL—3700(Pt.3), pp 41-49) **Atmospheric carbon dioxide abundance: an archival study of spectroscopic data.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This article describes progress in a program to determine the atmospheric abundance of carbon dioxide (CO_2). Efforts are direct-

ed toward measuring the abundance of CO_2 dating back to the 1890s, using absorption spectra of the sun as the source of data. In addition, the properties of Mt. St. Helens-related aerosols will be quantified from solar extinction measurements.

16070 (PNL—3700(Pt.3), pp 55-60) **Long range transport modeling.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

The objectives of this study are to develop national interregional transport matrices for sulfur dioxide and other pollutants, and to improve the air pollution models in order to produce more efficient and cost-effective assessments. To this end, the use of time-averaged precipitation for wet removal in a regional air pollution assessment model is discussed.

16071 (PNL—3700(Pt.3), pp 121-125) **Oil shale fugitive air emissions.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This paper presents the atmospheric transport and plume depletion investigations using dual tracers in the Colorado oil shale region. Lithium particle detector calibrations are also presented along with an evaluation of potential contamination of sulfur hexafluoride bag samples.

16072 (PNL—3700(Pt.3), pp 127-133) **DOE/RL special studies.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This study was undertaken to explore the feasibility of using inventories of trace materials and gases within atmospheric airsheds to assess the transport, metamorphosis, and removal of airborne pollutants. This initial study was an attempt to describe atmospheric budgets for certain trace gases and aerosols generated in the metropolitan area of Puget Sound and to quantify the accumulation or removal of pollutants downwind in Central Washington. Seasonal variation of turbidity of Hanford is also discussed.

16073 **(SAND—79-1336) Lagrangian measurement platform flights in support of the Tennessee Plume Study: field effort and data.** Gay, G.T.; Zak, B.D.; Barker, B.; Holland, R.M. Jr.; Homann, P.S. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 180p. NTIS, PC A09/MF A01.

During the month of August 1978, two Lagrangian measurement platform (LAMP) experiments were conducted in conjunction with the Environmental Protection Agency's Tennessee Plume Study. In both experiments, the LAMP was launched into the Cumberland Power Plant plume. The instrumented balloon system provided data on the chemical and physical behavior of the pollutants downwind from the plant over the duration of the flights. A description of the field effort, the data acquired, and some preliminary results are presented here.

16074 **Ruminant methane $\delta(^{13}C/^{12}C)$ values: relation to atmospheric methane.** Rust, F. (Argonne National Lab., IL). *Science ;* **211**: 1044-1046(6 Mar 1981).

The $\delta(^{13}C/^{12}C)$ - values of methane produced by fistulated steers, dairy cattle, and wethers, and dairy and beef cattle herds show a bimodal distribution that appears to be correlated with the plant type (C_3 or C_4, that is, producing either a three- or a four-carbon acid in the first step of photosynthesis) consumed by the animals. These results indicate that cattle and sheep, on a global basis, release methane with an average $\delta(^{13}C/^{12}C)$ value of -60 and -63 per mil, respectively. Together they are a source of atmospheric methane whose $\delta(^{13}C/^{12}C)$ is similar to published values for marsh gas and cannot explain the 20 per mil higher values for atmospheric methane.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 15367, 15406, 16066

16075 **(GEPP-EM—570) Environmental monitoring report, 1980: Pinellas Plant.** (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). Mar 1981. Contract AC04-76DP00656. 37p. NTIS, PC A03/MF A01.

Results of the monitoring program at the Pinellas Plant are described. Small quantities of tritium gas, tritium oxide, carbon-14 labeled solvent and krypton-85 gas were released from the plant during the year. Average maximum ground level concentrations of these radioisotopes were all significantly less than 0.1% of the recommended guide for continuous nonoccupational exposure. Off-site releases of liquid effluents were analyzed for compliance with the National Pollutant Discharge Elimination System (NPDES). Analyses were performed for biochemical oxygen demand, suspended solids, fecal coliform bacteria, pH, nitrogen, phosphorus, arsenic, chlorides, chromium, copper, cyanides, detergents, fluorides, iron, lead, mercury, oil plus greases, phenols, turbidity, and zinc. In addition to the non-radioactive parameters listed above, a small quantity of radioactive tritium oxide was released in the effluent. Analyses showed the average concentration was 0.20% of the nonoccupational exposure guide. Site perimeter and off-site air samples for tritium gas and tritium oxide, as well as off-site surface water samples obtained to distance of 9.6 kilometers (6 miles) from the plant site and analyzed for tritium content, showed levels significantly less than 0.1% of the recommended guide for continuous nonoccupational exposure. Small sealed plutonium sources containing approximately 80% plutonium-238 oxide and 20% plutonium-239 oxide and other isotopes, are utilized at this site. No plutonium was released to the environment.Calculations were made to determine the radiation doses resulting from releases of tritium oxide, ^{85}Kr, and ^{14}C to: an individual at the site boundary; individuals in the closest residential area; and the population within 80 kilometers (50 miles) of the plant site. The total dose commitment to the population residing within 80 kilometers was determined to be 0.55 man-rem as compared to the annual dose from natural radiation of 223,165 man-rem.

16076 (PNL—3700(Pt.3), pp 91-94) **Fallout rates and mechanisms.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

Radionuclide concentrations were measured at Barrow, Alaska and Richland, Washington for the assessment of the hazard to the environment presented by future radionuclide releases. In addition, the physical and chemical forms of airborne radionuclides and their deposition rates were determined and the rates of atmospheric mixing of radionuclides were calculated.

16077 (PNL—3700(Pt.3), pp 95-110) **Particle resuspension and translocation.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

Particle resuspension rates and air concentrations of plutonium were investigated as functions of atmospheric stresses, local soil-working stresses, particle variables and surface variables.

16078 (PNL—3700(Pt.3), pp 113-116) **Reactor Safety Study.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This study reviews the meteorological aspects of the Reactor Safety Study, WASH-1400, and identifies areas requiring improved descriptions for more realistic assessments of reactor-accident consequences.

5004 Thermal Effluents Monitoring And Transport

16079 (PNL—3700(Pt.3), pp 51-54) **Meterological Effects of Thermal Energy Releases (METER).** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

The objective of this study was to investigate the effects of the addition of chemical, thermal and humidity plumes to the atmosphere relatively near the 3200-megawatt Bowen plant, one of the largest coal-fired plants in the world. A network of 140 rain gauges was deployed within 1.2 km to the east of the Bowen plant. The purpose of this network was to investigate the possible enhancement of rainfall in the zone embraced by the cooling tower condensate plumes.

5006 Regulations

REFER ALSO TO CITATION(S) 16064

16080 **(ORNL/EIS—176) US Department of Energy environmental compliance program hanbook: federal regulations on air quality, Fossil Energy.** Huffstetler, J.; Collier, B.N.; Brown, K.; McAfee, N. (Oak Ridge National Lab., TN (USA)). Feb 1981. Contract W-7405-ENG-26. 193p. NTIS, PC A09/MF A01.

This handbook identifies those federal laws and regulations on management of air quality that could affect the siting, construction, or operation of a fossil energy facility. All entries are part of a computerized data base built and maintained for DOE at Oak Ridge National Laboratory.

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 16091, 16092

16081 **Field studies of mineral nutrition of Larrea tridentata: importance of N, pH, and Fe.** Hunter, R.B.; Wallace, A.; Romney, E.M. (Univ. of California, Los Angeles). *Great Basin Naturalist ;* No. 4, 163-167(1980).

Multivariate analysis of soil and plant data from the northern Mojave Desert was used to investigate aspects of the mineral nutrition of Larrea tridentata (Sesse and Moc. ex DC.) Cov. Larrea tridentata biomass was significantly correlated with soil NO_3^- and pH and leaf Fe content. Leaf cation accumulation was negatively correlated with leaf Fe concentration.

16082 **Phytosociological study of a small desert area in Rock Valley, Nevada.** El-Ghonemy, A.A. (University of Tanta, Egypt); Wallace, A.; Romney, E.M.; Valentine, W. *Great Basin Naturalist ;* No. 4, 59-72(1980).

The aim of this study was to gain more understanding of the compositional structure of vegetation in the US/IBP Desert Biome validation site located in Rock Valley, Nevada. The vegetation data collected from 85 stands, randomly distributed to cover all physiographic variations in the study site, permitted categorization of the vegetation units either by coordinates or by class membership. The vegetational groupings so identified were then used for constructing a more reliable vegetation map for the Rock Valley validation site.

16083 **(PNL—2754) Behavioral ecology of the Swainson's Hawk (Buteo swainsoni) in Washington.** Fitzner, R.E. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Dec 1980. Contract AC06-76RL01830. 79p. NTIS, PC A05/MF A01.

This study examines the breeding ecology and behavior of the Swainson's Hawk (Buteo swainsoni) on its breeding ground in southeastern Washington. Seasonal movements and distribution of the buteo are also described. The birds were observed from blinds, or filmed by Super-8mm time-lapse cameras, during courtship, nest building, egg laying, incubation, and nestling and post-fledging development. Food habits were examined during the nestling and post-fledging periods. Snakes, especially the abundant Western Yellow-bellied racers, were a prey staple, and insects became an important food source during the post-fledging period. It was apparent that Swainson's Hawks feed on smaller and more diverse prey than sympatric buteos (Red-tailed and Ferruginous Hawks), thus reducing competition with neighboring congenerics. Interactions with buteos and other raptor genera were observed, and nearest neighbor distances measured. Organochlorine pesticides in prey species consumed by Swainson's Hawks are concentrated from prey to predator through the food chain. The hawk pellets (regurgitated castings) would contain those concentrations and could easily be monitored without sacrificing any part of the food chain.

16084 (PNL—3700(Pt.2), pp 1-8) **National Environmental Research Park.** Rickard, W.H. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The National Environmental Research Park (NERP) at Hanford is an outdoor laboratory dedicated to research and education leading to the better understanding of ecological systems and the impact of energy technology development upon them. It supports ecosystems representative of semi-arid shrub steppe, some of which are believed to be in near-pristine condition. These ecosystems serve as baseline cases suitable for objectively judging the magnitude and direction of ecosystem-level changes induced by time and by man's manipulations in the shrub steppe region. The studies that are concerned with the use of revegetated land by birds and small mammals in the shrub steppe region are described.

16085 (PNL—3700(Pt.2), pp 9-11) **Terrestrial ecology.** Rogers, L.E. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The Terrestrial Ecology Program is dedicated to long-term ecological studies conducted on the Arid Lands Ecology (ALE) Reserve. The focus of the studies concerns the response of western arid-land ecosystems to man-induced and natural perturbations. Wildlife utilization studies of disturbed plant communities have been emphasized during the past two years and are included in detail in this report.

16086 (PNL—3700(Pt.2), pp 13-14) **Dynamics of wild populations.** Eberhardt, L.L. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The main objectives of this project are to evaluate the available data on the population dynamics of plants and animals and to conduct research on quantitative methodology used for assessing the diversity of species in a community. A major goal is to advance our understanding of population regulation as it bears on the management of unconfined plant and animal populations.

16087 (PNL—3700(Pt.2), pp 15-16) **Restoration of surface-mined lands.** Sauer, R.H. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

A major problem in restoring the vegetative productivity of western arid strip-mined lands is the difficulty of providing enough water to re-establish and maintain vegetation. The purpose of this program is to demonstrate the technical and economic feasibility of using the techniques of water harvesting to provide irrigation water for useful crops in arid surface-mined lands. The strategy is to use the slopes of moderately re-graded spoil material to gather rain and snow. This program is gathering information on optimum crops, slope angles, and slope treatments in an effort to reduce the costs of reclamation, reduce the consumption of valuable resources (water and soil) and establish productive, useful crops where only weeds would otherwise grow.

16088 (PNL—3700(Pt.2), pp 17-19) **Long-term ecological monitoring.** Hinds, W.T. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The objective of the Pacific Northwest Laboratory Long-Term Ecological Monitoring Project is to develop monitoring designs able to detect ecological changes associated with energy technologies in the Northwest. Potential causes of change can have either localized or widespread impacts. Ecological monitoring of Northwest habitats is currently divided into two task areas. The Forest Monitoring Task is monitoring productivity of forest and steppe vegetation using a litterfall-analysis technique, and the vertebrate task is monitoring transfers of contaminants along food chains using biological materials incidental to reproduction of wide-ranging predatorial birds.

16089 (PNL-SA—8504) **Bald eagles of the Hanford National Environmental Research Park.** Fitzner, R.E.; Watson, D.G.; Rickard, W.H. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1980. 16p. NTIS, PC A02/MF A01.

Since 1961, near-yearly aerial surveys of bald eagles along the Hanford reach of the Columbia River have been conducted. Prey resources available to the eagles have also been monitored and we have thus been able to examine predator-prey relationships in a statistical fashion. We report on a unique set of data which provides insight into one of the factors (prey availability) controlling bald eagle wintering populations. The winter distribution of the bald eagle (Haliaeetus leucocephalus) has been reported to closely follow the availability of prey (Servheen 1975, Southern 1963, Shea 1973, Spencer 1976). Fitzner and Hanson (1979) compared twelve years of eagle winter survey data on the Hanford DOE Site with waterfowl numbers and salmon redd densities over the same period and provided some statistical evidence that eagle wintering numbers varied somewhat dependently with changing salmon redd numbers but not with changing waterfowl numbers. This report re-examines Fitzner and Hanson's (1979) twelve year data set and supplies two additional years of data for the Hanford DOE Site in order to gain additional insight into predator-prey interactions.

16090 **Multivariate analysis of the vegetation in a two-desert interface.** El-Ghonemy, A.A. (University of Tanta, Egypt); Wallace, A.; Romney, E.M. *Great Basin Naturalist ;* No. 4, 42-58(1980).

This report further describes the distribution and ecological characteristics of the natural vegetation at the Mojave Desert-Great Basin Desert interface. The region studied is one of extraordinary biological interest because of its geographic location straddling the boundaries of two large deserts of the western United States, and because of the kind and manner of its past land use (atmospheric and underground testing of nuclear devices). The present analysis determines the magnitude of variations in the phytosociological structure in this region and evaluates some relationships between its vegetation and environment. Vegetation and soils were sampled in 66 stands representing many possible physiographic variations. Relative density and relative coverage were determined for each perennial species and summed to provide an estimate of its importance value (I.V.). Importance values were used to ordinate stands to provide a synthesis of the phytosociological data and to portray the compositional relationships of species. The results of this study indicate that the area is dominated by several interrelated vegetational groupings. Correlations between the vegetational groups and the different environmental variables indicate that the distributional pattern of the vegetation is controlled largely by soil physical properties, salinity, and fertility levels.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 15788

16091 (PNL—3700(Pt.3), pp 83-90) **Air pollution dry deposition: radioisotopes as particles and volatiles.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This study focuses on determining volcanic ash and ambient airborne solids concentrations at various sampling sites subsequent to the Mt. St. Helens' eruption in order to develop an experimental basis for models predicting removal of airborne particles and gases by dry deposition onto outdoor surfaces. In addition, deposition rates were determined using dual tracer techniques in the field and in a wind tunnel in the laboratory.

16092 (PNL—3700(Pt.3), pp 61-77) **Theoretical studies and applications.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 3. Atmospheric sciences.

This selection of papers deals with developing theoretical models for describing the fate of energy-related air pollutants and the translation of theory and data into forms useful for evaluating the consequences of airborne pollutant releases. Precipitation efficiency and scavenging, the identification of some natural sinks for gaseous sulfur compounds and particle deposition models are discussed.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 15366

16093 (DOE/SF/00012—T12) **Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.** Wallace, A.; Schulz, R.K.; Romney, E.M.; Nishita, H.; Herman, D.J. (California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology). Feb 1980. Contract AC03-76SF00012. 154p. (UCLA—12-1235). NTIS, PC A08/MF A01.

The year FY 1979 was a transition year between start up of work at the low level waste burial site at Maxey Flats, Kentucky and completion of previous work involving laboratory studies with radionuclides. All of our studies are designed to solve problems or verify situations that exist in the field. The thrust at Maxey Flats by this group involves soil moisture and radionuclide movement at that burial site in a humid region. Vegetation cover is being manipulated, rooting depth is being studied, water penetration and flow are being measured, radionuclide uptake by plants and concentration in components of soil moisture are being measured. Goals are to determine how water is penetrating trenches and how to minimize such penetration. Laboratory studies involve fission and transuranic radionuclides with a future focus placed primarily upon field problems related to low level waste burial problems and soils. Some past studies being completed involved transuranic elements and a cross-section of USA soils. Different sized containers have been involved in the studies so that results can be extrapolated to field conditions. Analytical work is almost completed and the data are being synthesized. Some preliminary organization of the data is included in this annual report. Concentration ratios, plant part discrimination ratios and radionuclide ratios are included in the initial evaluation. The laboratory phase of this study is to be completed in the next fiscal year with more effort being redirected toward field studies at the shallow land waste burial site. Separate abstracts have been prepared for 9 items in this report for inclusion in the Energy Data Base.

16094 (DOE/SF/00012—T12, pp 62-81) **Uptake and translocation of ^{237}Np, ^{238}Pu, ^{239,240}Pu, ^{241}Am, and ^{244}Cm by a wheat crop.** Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

The primary objective of this study was to investigate the pot-to-pot variability encountered when a very carefully run plant uptake experiment was carried out. It was felt that this study could form a firm basis for other experiments to follow in this project. To carry out this experiment, soil was uniformly contaminated with ^{237}Np, ^{238}Pu, ^{239,240}Pu, ^{241}Am, and ^{244}Cm and added to each of 25 plant growth containers. A wheat crop was grown to maturity and the various plant parts radioassayed using the procedure described in the last annual report. As a corollary to this study on variability, the data obtained in this work gives information on the relative uptake and translocation of ^{238}Pu as compared to ^{239,240}Pu. A similar comparison of interest is between ^{241}Am and ^{244}Cm uptake as these elements have quite similar solution chemistry.

16095 (DOE/SF/00012—T12, pp 82-93) **Analysis of soybean crop grown in soils contaminated with four transuranic elements.** Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

The work done in this project has been directed at assessing parameters associated with soil to plant transfer of radionuclides. Seven soils were selected as representing a wide range of soil characteristics, from acidic and mineral soils to alkaline and organic soils. The soils were uniformly contaminated with isotopes of Np, Am, Cm, and Pu, then mixed and placed in 52 gallon containers. Five replicates of each soil were used. The crop investigated was soybeans. The seeds were planted, and the soils were treated with a N fertilizer. The crop was allowed to mature for twenty-seven days, at which time a preliminary harvest was made. The final harvest was taken seventy-three days after planting, except for the plants on the Lyman soil. These were given ninety-one days to mature. The plants were divided into stems, leaves, pods, and seeds, then assayed for neptunium, americium, cerium, and plutonium.

16096 (DOE/SF/00012—T12, pp 94-100) **Analysis of crop of peas grown on soils contaminated with four transuranic elements.** Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

In order to gain more refined data on principles of soil to plant transfer of radionuclides, an experiment is being conducted whereby various soils contaminated with ^{237}Np, ^{239}Pu, ^{241}Am, and ^{244}Cm are cropped with agriculturally significant plant species. The organic and mineral soils used in this experiment are representative of a wide range of soil conditions occurring throughout the United States. An analysis of a pea crop grown in this experiment is the subject of this report. Peas were grown to maturity, harvested, and divided into leaves, stems, pericarp, and seeds. Yield data was obtained for each plant part. The leaves and seeds of plants grown on six of the seven soils were assayed for the four elements, and all four parts of those plants grown on Yolo soil were assayed.

16097 (DOE/SF/00012—T12, pp 101-107) **Analysis of third wheat crop grown in soils contaminated with four transuranic elements.** Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

Conditions which affect soil to plant transfer of radionuclides are currently under study for use in NRC models predicting such phenomena. This particular experiment involves the radiochemical assay of crops grown on seven soils uniformly contaminated with ^{237}Np, ^{239}Pu, ^{241}Am, and ^{244}Cm. The soils used vary widely in chemical and physical properties, such as organic and mineral contents, and solution pH. Wheat is used in this experiment in order to provide a control base for the determination of long term effects of transuranic elements in the soil. This crop of wheat was planted in the spring, grown to maturity, and harvested. Individual plants were divided into grain, straw, and chaff, and then weighed. Oven-dried grain and straw were ground in a Wiley mill, and subsequently assayed for the four elements. The data for each soil were summarized, and certain statistical analyses were conducted.

16098 (DOE/SF/00012—T12, pp 127-137) **Relative adsorption and plant uptake of ^{238}Pu and ^{239}Pu in soils.** Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

Several investigators have observed differences of behavior between ^{238}Pu and ^{239}Pu in natural environments. Some data indicate that the downward migration of ^{238}Pu in the soil might be occurring at a faster rate than that observed for ^{239}Pu. The objective of the present investigations was to confirm the reportedly greater apparent solubility and mobility of ^{238}Pu in comparison to ^{239}Pu in the environment. This was pursued by plant uptake and chemical extraction experiments in the laboratory. The present experiments indicate that ^{238}Puand ^{239}Pu react chemically in an identical manner.

16099 (DOE/SF/00012—T12, pp 138-144) **Effect of DTPA on concentration ratios of ^{237}Np and ^{244}Cm in vegetative parts of bush bean and barley.** Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

Bush beans (Phaseolus vulgaris L.) and barley (Hordeum vulgare L.) were grown in two different soils (noncalcareous and calcareous) in containers in a glasshouse with 530 pCi/g ^{237}Np or 15040 pCi/g ^{244}Cm mixed into separate containers of the soil. The chelating agent DTPA at 100 μg/g soil was added to one half of the containers. The concentration ratio (C.R.) without DTPA was two orders of magnitude higher for ^{237}Np than for ^{244}Cm by two and three orders of magnitude but had little influence on ^{237}Np. For the calcareous soil with DTPA, ^{244}Cm C.R.'s were greater than those for ^{237}Np. In bush beans both ^{237}Np and ^{244}Cm C.R.'s were higher in primary leaves than in trifoliate leaves which were higher than for stems.

16100 (DOE/SF/00012—T12, pp 145-150) **Studies to measure ability of deep-rooted plants to take up Pu and Am from deep portions of soil.** Feb 1980.

In Agricultural aspects of monitoring and stabilization of shallow land-burial sites. Annual report, October 1, 1978-September 30, 1980.

Studies have been under way for almost two years to further ascertain ability of deep rooted plants to take up radionuclides. Transuranic elements were of interest in this study. These studies have relevance to shallow land disposal of radionuclides because of past burial practices at different locations. This experiment serves to both measure uptake but also to demonstrate the ability of alfalfa roots to easily penetrate ten feet of soil which is deeper than the top of some shallow land burial trenches. The experiment is in progress and as yet none of the analytical data are available.

16101 **(DP-MS—80-106) Oxidation of molecular tritium by intact soils.** Sweet, C.W.; Murphy, C.E. Jr. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1980. Contract AC09-76SR00001. 16p. (CONF-810308—8). NTIS, PC A02/MF A01.

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The effects of environmental factors on the rate of oxidation of molecular tritium (T_2) to tritiated water (HTO) were determined for intact soils during field exposures. Maximum deposition velocities of approximately 0.03 cm/sec were measured for T_2 at low wind speeds for a variety of soils over a wide range of conditions. Deposition velocities were slightly inhibited in wet soils and at 0°C. In dry soils, oxidation of T_2 to HTO occurred deeper in the soil profile, but deposition velocities were unaffected.

16102 **(PNL—3700(Pt.2)) Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.** Vaughan, B.E. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Feb 1981. 190p. NTIS, PC A09/MF A01.

Separate abstracts were prepared for 33 topics discussed in this progress report. Section 11 which deals with the energy-related research for other agencies such as EPA, NOAA, NSF, and NRC is not represented by a separate abstract. (KRM)

16103 (PNL—3700(Pt.2), pp 69-70) **Quantitative aspects of transuranic and other radionuclide field studies.** Gilbert, R.O.; Simpson, J.C.; Kinnison, R.R. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The purpose of this project is to identify, develop and communicate statistical methodology for environmental actinide studies. Significant accomplishments of FY 1980 were continued publication of TRAN-STAT, acquisition of preliminary results from a computer simulation study for evaluating estimators of average ratios, and the review of statistical estimation methods for data near detection limits.

16104 (PNL—3700(Pt.2), pp 79-81) **Environmental behavior and effects of technetium 99 and iodine 129.** Garland, T.R.; Cataldo, D.A.; Wildung, R.E.; Cadwell, L.L.; McFadden, K.M.; Schreckhise, R.G.; Rogers, J.E.; Li, S.W.; Thomas, J.M. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The principal objective of this program is to define the environmental behavior of ^{99}Tc and ^{129}I, two long-lived radioactive by-products of the nuclear fuel cycle which have received little study. Preliminary assessments using soil-to-plant transfer coefficients derived from laboratory studies in simple dose-to-man models indicate that ^{99}Tc may contribute a major fraction of the long-term radiation dose commitment from existing and future dispersement of radionuclides in the environment. Although the research on this program has shown Tc and I to be mobile in the environment and readily taken up by plants and animals, adequate assessment of the potential hazards to man require a more thorough understanding of the mechanism that may limit their effects or reduce their long-term mobility in the environment.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 15244, 15262, 15365

16105 **(PB—80-170004) Lead particles in the Great Smoky Mountains biosphere reserve. Interim report.** Wiersma, G.B.; Frank, C.W.; Brown, K.W.; Davidson, C.I. (Environmental Protection Agency, Las Vegas, NV (USA). Environmental Monitoring Systems Lab.). Jan 1980. 19p. NTIS, PC A02/MF A01.

Remote air monitoring using 0.45-micrometer Millipore filters at eight remote sites in the Great Smoky Mountains National Park has shown that lead particulates are contributing to the contamination of this designated biosphere reserve. Analytical results of these filters by atomic absorption spectrophotometry, x-ray fluorescence, and scanning electron microscopy showed that lead air concentrations varied frm a high of 141.ng/cu m to a low of 18.9 ng/cu m. The spherical shape of the lead particulates indicates that the moieties were formed by high temperature processes, such as by internal combustion engines. Also, the small particulate size may indicate long range transport and subsequent deposition from urban and/or industrialized areas.

16106 **(PNL—3504) Catalog of borehole geophysics on the Hanford Site, 1958 to 1980.** Blair, S.C.; Law, L.S.; Lindberg, J.W. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Mar 1981. Contract AC06-76RL01830. 114p. NTIS, PC A06/MF A01.

This report catalogs geophysical borehole data acquired between January 1, 1958 and April 8, 1980 for nearly 800 wells on and around the Hanford Site. These data have been placed in a format that can be easily adapted to a computerized data management system. Maps are provided for quick identification of specific wells. Each well is classified according to the amount of geophysical logging data available. A cross reference between common well name and the Hanford grid name is given to eliminate confusion among various sources of data.

16107 (PNL—3700(Pt.2), pp 21-23) **Application of long-term chemical biobarriers for U-tailings.** Cline, J.F.; Cataldo, D.A.; Burton, F.G.; Skiens, W.E. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The objective of this project is to develop and evaluate the effectiveness of physical and chemical barriers that are designed to prevent plant and animal breachment of uranium tailings containment systems for extended periods of time. The development of a polymeric carrier/delivery system and the construction of rock asphalt barriers to prevent plant or animal intrusion are discussed.

16108 (PNL—3700(Pt.2), pp 25-26) **Revegetation of inactive U-tailing sites.** Cadwell, L.L.; Hinds, N.R.; McShane, M.C.; Sauer, R.H.; Skalski, J.R. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Soil placed over any sealant/barrier system can provide a protective mantle if the soil is not lost by erosion. Vegetation is an attractive choice for controlling erosion because it can provide an economical self-renewing cover that serves to reduce erosion by both wind and water. The objective of this research and development effort is to select and test vegetation strategies, including the choice of species and methods for revegetation that are compatible with sealant/barrier systems and are suited to soils and climates at inactive uranium mill tailings sites.

16109 (PNL—3700(Pt.2), pp 31-37) **Ecological investigation of Alaskan resource development.** Hanson, W.C.; Eberhardt, L.E. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The objective of this research is to provide an integrated program for the definition of ecological consequences of resource developments in northern Alaska. Information is presented on affected populations of arctic foxes, small mammals, and tundra-nesting birds in the Prudhoe Bay oil field and along the Trans-Alaska Pipeline and haul road; findings from similar studies from the Colville River Delta and other affected habitats; field experiments to determine the sensitivity of lichen communities of the Brooks Range to sulfur dioxide concentrations likely to be encountered near pipeline pumping stations; and amounts of radionuclides from worldwide fallout in the lichen-caribou-Eskimo food chain.

16110 **Development of a succession model for subtropical rain forest and its application to assess the effects of timber harvest at Wiangaree State Forest, New South Wales.** Shugart, H.H. Jr. (Oak Ridge National Lab., TN); Hopkins, M.S.; Burgess, I.P.; Mortlock, A.T. *Journal of Environmental Management ;* **11**: No. 3, 243-265(Nov 1980).

The KIAMBRAM model, a computer model of complex notophyll vine forest (subtropical rain forest) in Australia near the New South Wales/Queensland border, is documented and results of the model are presented. The model simulates a 1/20-ha forest stand by considering explicitly the birth, death, and growth of each tree in the stand. The model also allows the selective harvest of any of the 125 species considered at any desired frequency. The model is tested on its ability to simulate species dynamics following disturbance and to predict the composition of mature forest. The model is used to assess the consequences of the harvest of commercial species from the complex notophyll vine forest both in terms of a single harvest and of a repeated harvest. The KIAMBRAM model predicts that repeated logging on a 30-year cycle would lead to rain forest in which cover was maintained but species composition altered. The composition would shift toward species of earlier successional stages, of lower value as logs. The volume available for harvest would be smaller. Application of the model to other tropical rain forests in discussed.

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 15490

16111 **Laboratory experiments to determine if crayfish can communicate chemically in a flow-through system.** Itagaki, H.; Thorp, J.H. (Savannah River Ecology Lab., Aiken, SC). Contract EY-76-C-09-0819. *Journal of Chemical Ecology ;* **7**: No. 1, 115-126(Jan 1981).

The importance of chemical cues for transmitting information concerning sexual identity, agonistic state, and stress-related condition in the crayfish Procambarus clarkii (Girard) was examined in a flow-through system. Experiments tested the effects of conditioned water from stimulus tanks on the behavior of solitary male or female crayfish. Twenty males and 20 females were subjected to a random sequence of five treatments: unconditioned

water (control), conditioned water flowing through tanks containing a solitary male or female, and conditioned water from tanks holding either two males or two females. Durations of the following behaviors were recorded: chelae up, chela(e) in baffle hole, chela waving, climbing, digging, grooming, gross body movement, and meral spread. Results indicated that crayfish chemically detected another animal within 0.25 m without additional visual or tactile stimuli; however, crayfish apparently did not communicate information on sexual identity, agonistic state, or stress condition, nor does this detection necessarily imply discrimination between stimuli from crayfish and other taxa (e.g., fish). Our conclusions are contrasted with the two previous reports on chemical communication in crayfish in which experimental animals were tested in static systems. We suggest that a temporal separation of molting and copulation and a long reproductive receptivity period for females (which would allow abundant intersexual encounters) could account for a lack of selective pressure to evolve long-distance sex pheromones.

16112 **Marine benthic dynamics.** Tenore, K.R.; Coull, B.C. (eds.). Contract FG09-79EV10090. Columbia, SC; University of South Carolina Press (1980). 453p. (DOE/EV/10090—1; CONF-7904155—).

From 11. Bell W. Baruch symposium in marine science; Georgetown, SC, USA (Apr 1979).

The proceedings from this symposium contain an overview of the benthic ecosystem. The structure, population dynamics, and secondary production of benthic ecosystems are discussed in light of the role of detritus and nutrient cycling in the food chain. The twenty three articles of presentation are grouped by categories of secondary production, population studies, nutrient cycling, and detritus and are summarized and indexed with an abstract for each presentation. (DS)

16113 (PNL—3700(Pt.2), pp 125) **Service assessment studies.** Watson, D.G. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Service Assessment Studies, supported through the Richland Operations Office, involve long-term ecological monitoring of animals likely to be affected by the industrial development of the Hanford site. This is a low-level effort, now in its third decade, which has provided valuable documentation of the efficacy of environmental control measures at this site. This paper focuses on spawning surveys of the Chinook salmon in the Hanford area of the Columbia River.

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 15247, 15293, 15335, 16102, 16120, 16210, 16214, 16215

16114 **(AD-A—088062) Performance tests of high speed ZRV oil skimmer. Final report 8 Sep-13 Oct 79.** Breslin, M.K. (Environmental Protection Agency, Leonardo, NJ (USA). Ohmsett Test Facility). Jun 1980. Contract DOT-CG-842702-A. 156p. NTIS, PC A08/MF A01.

A self-propelled catamaran oil skimmer developed by the USCG capable of recovering oil from a water's surface was tested at the U.S. EPA OHMSETT facility. The skimmer employed an endless composite sorbent belt processed between the catamaran hulls to recover oil. The tests were designed to determine the effect that various parameters (skimmer speed, oil viscosity, oil thickness, wave conditions, etc.) have upon oil recovery performance. The skimmer was towed through oil slicks at various speeds in different wave conditions as it was operated to collect oil. The collected fluid was quantitatively analyzed to determine the device's oil-to-water recovery ratio (recovery efficiency), oil recovery rate and thoroughness of slick removal (throughput efficiency). The device proved capable of good throughput efficiency in all wave conditions (up to 0.7 m confused seas) at all the tow speeds tested (1 to 6 knots). Throughput efficiencies of 80 to 90% in calm water were common with all the oils tested. The performance of the full-scale skimmer agreed well with the results from the smaller prototype tested in 1976. The successful development of this skimmer provides a significant advance in oil spill recovery capability and technology. The concept used in this oil skimmer can be employed at speeds greater than those tested. Two oil slick converging systems were tested with the skimmer to effectively double the sweep width of the skimmer. Additional tests were conducted to determine vessel resistance and motion in waves and to assess the buildup of potentially explosive vapors within the oil recovery system.

16115 **(DOE/ER/10766—1) Mitigation of biofouling using coatings. Quarterly progress report No. 1.** Meyer, A.E.; King, R.W.; Wilkinson, M.A. (Calspan Corp., Buffalo, NY (USA)). 15 Dec 1980. Contract AC02-80ER10766. 7p. NTIS, PC A02/MF A01.

Progress is reported in this project to evaluate benefits associated with control of the surface energetic properties of materials used in heat exchangers; and to identify preferred ranges of these surface conditions that minimize deposits of biological fouling known to deteriorate heat exchange efficiencies in seawater, brackish water, and freshwater systems. The technical approach uses special diagnostic plates in novel flow cells where fluid flow conditions can be well-controlled, modifying the surface chemistry and surface energy of the plates with very thin coatings and examining the earliest events of biofouling caused by macromolecules and microbial organisms. A preliminary list of test surfaces is given. Initial progress was made for measuring heat exchange coefficients using germanium internal reflection plates. A coastal marine aquarium system was established to simulate real-world biofouling conditions.

16116 **(DOE/ER/10766—2) Mitigation of biofouling using coatings. Quarterly progress report No. 2.** Meyer, A.E.; King, R.W.; Ziegler, R.C. (Calspan Corp., Buffalo, NY (USA)). 16 Mar 1981. Contract AC02-80ER10766. 21p. NTIS, PC A02/MF A01.

Progress is reported in research designed to evaluate benefits associated with control of the surface energetic properties of materials used in heat exchangers; and to identify preferred ranges of these surface conditions that minimize deposits of biological fouling known to deteriorate heat exchange efficiencies in seawater, brackish water and freshwater systems. The technical approach employed uses special diagnostic plates in novel flow cells where fluid flow conditions can be well-controlled, modifying the surface chemistry and surface energy of the plates with very thin coatings and examining the earliest events of biofouling caused by macromolecules and microbial organisms. An aquarium system described previously was equilibrated and some initial exposure experiments were carried out. Six silane compounds were used to coat germanium plates for coating viability experiments.

16117 (PNL—3700(Pt.2), pp 89-92) **Bioavailability of energy effluent materials in coastal ecosystems.** Crecelius, E.A.; Gibson, C.I.; Hardy, J.T.; Rogers, J.E.; Schmidt, R.L. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

This research program involves a multidisciplinary effort to determine the bioavailability of energy-effluent materials in the marine ecosystem. During the last several years, our major goal has been to better predict the bioavailability and fate of copper in the coastal ecosystem. Recent efforts involve four main tasks: (1) bioavailability of dissolved and organically-bound Cd to the littleneck clam, Protothaca staminea; (2) chemical speciation of cadmium in sea water; (3) interaction of sediment with Cu and Ni; and (4) toxicity of atmospheric particulate matter to phytoplankton.

16118 **(UCRL—85311) Quality-assurance requirements for automated water-quality laboratories.** Barton, G.W. Jr. (Lawrence Livermore National Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 23p. (CONF-810422—1). NTIS, PC A02/MF A01.

From ASTM Committee E-36 symposium on evaluation and accreditation of activities; Washington, DC, USA (29 Apr 1981).

In the course of assisting the USEPA and the USGS in automating their water quality surveillance laboratories, quality assurance requirements for this function were investigated in detail. It was found that while computerization of instruments and functions can be of great assistance in operations, scientific insight must, in

the end, be the final judge of quality. These laboratories engage in several kinds of activities which differ in important details. One of them had the primary mission of analytical methods development and validation. Another was the analytical facility for sewage treatment process development. The others engaged in three different activities, special surveys to establish baseline water standards, routine surveillance to detect variations from baseline, and special studies to collect the data for action against polluters. The similarities and differences of requirements in these various situations are discussed.

16119 **Hazardous waste and drinking water. Joint hearing before the Subcommittee on Health and Environment and the Subcommittee on Transportation and Commerce of the Committee on Interstate and Foreign Commerce, House of Representatives, Ninety-Sixth Congress, Second Session, August 22, 1980.** Washington, DC; Committee on Interstate and Foreign Commerce (1980). 198p. GPO.

Compiled are formal statements, formal presentations, and materials for the record presented before a joint hearing, before the Subcommittee on Health and the Environment and the Subcommittee on Transportation and Commerce of the House of Representatives. Hazardous wastes and the contamination of ground drinking water are discussed in view of the transportation of these wastes. Statements are presented by several environment-concern citizens groups and also by public agencies.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 15405, 16075, 16102

16120 (PNL—3700(Pt.2), pp 93-95) **Marine chemistry of energy-related pollutants. Iron-55 phenomenon.** Crecelius, E.A.; Robertson, D.E.; Abel, K.H. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

These programs are designed to increase understanding of the biogeochemical and physical processes that control the fate of energy-generated pollutants that enter the marine environment. This research provides an understanding of (1) the natural origins, distributions and concentrations in baseline data of trace metals and other contaminants in the oceans; (2) the input rates and mixing rates of pollutants introduced to the oceans; (3) the behavior and fate of the anthropogenic pollutants entering the oceans from the atmosphere and the continents; and (4) provides an assessment of the potential environmental impact of energy-generated pollutants on the marine environment.

16121 (PNL—3700(Pt.4), pp 93-99) **Transuranic chemical species in groundwaters.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

Groundwater transport of the transuranic radionuclides is a little understood problem of immediate concern to DOE and other regulatory agencies. At the Hanford N-Reactor site a unique groundwater microcosm exists which allows the study of the physicochemical processes that control the mobility of radionuclides in groundwaters. This system is being utilized as a natural laboratory to identify specific forms of the transuranic radionuclides that migrate in groundwater and to determine the rates and mechanisms that control this migration.

5204 Thermal Effluents Monitoring And Transport

16122 (PNL—3700(Pt.2), pp 109-110) **Effects of hydroelectric generation on riverine ecology.** Becker, C.D.; Fickeisen, D.H. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Hydropower generation of peaking electricity requires frequent changes in the amount of water released through dam turbines. Changes in the amount of water released at dams affect water temperatures and cause downstream water levels to fluctuate. These fluctuating water levels cause changes in wetted habitat areas. Field studies examined the reproductive success of smallmouth bass populations in the Hanford area of the Columbia River as it related to fluctuating river stage and temperature. We also conducted studies of effects of dewatering on survival and development of chinook salmon eggs in artifical redds under controlled laboratory conditions.

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 15365, 15490, 15598

5206 Regulations

REFER ALSO TO CITATION(S) 15436, 15726

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

5301 Social And Economic Studies

REFER ALSO TO CITATION(S) 15725

16123 **(AD-A—084214) Study to modify the vulnerability model of the risk management system. Final report.** Perry, W.W.; Articola, W.P. (Enviro Control, Inc., Rockville, MD (USA)). Feb 1980. Contract DOT-CG-74188-A. 212p. NTIS, MF A01.

The Vulnerability Model (VM) is a computer model which simulates hazardous materials spills and computes the consequences to people and property from resulting fires, explosions, or toxic vapors. This report describes recent work performed to prepare the VM for operational use. Four specific tasks or developments are described: (1) development of the user Interface Module (UIM), and easy-to-use conversational program which enables inexperienced or occasional users to set up and run VM simulations easily and reliably with little or no training; (2) development of a series of VM output display routines which display the results of VM simulations on CRT terminals or hard copy plotters; (3) development of ready-to-use Geographical/Demographic files for Los Angeles and New York Harbors (a file for New Orleans already exists); and (4) performance of a number of VM spill simulations for selected chemicals in Los Angeles and New York Harbors to operationally test the UIM/VM system and to provide a hazard ranking of the selected chemicals.

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 15436, 16119

16124 **(LMF—81) Diesel-exhaust emissions-toxicology program. Status report.** McClellan, R.O. (ed.). (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76EV01013. 63p. NTIS, PC A04/MF A01.

This document reports the current status of the Department of Energy's (DOE) Office of Environment (EV) research programs to assess the potential health impacts of increased use of diesel engines. The EV research effort consists of activities in five inter-related areas: (1) studies to establish the physical, chemical and biological characteristics of emissions from different vehicles over a range of operating conditions, fuel types and control devices; (2) evaluations to predict the transport and transformation of diesel exhaust as it moves from vehicles to the breathing zone of man; (3) research to predict the inhalation, deposition, retention and fate in the body of diesel exhaust particles and the organic compounds that are an integral part of the particles; (4) chronic exposure of laboratory animals to graded levels of diesel exhaust to determine the potential of these exposures for causing cancer or functional disorders, especially the respiratory tract, over the lifetime of the animals; and (5) development of an integrated risk assessment that brings togeth-

er all relevant information to predict (a) emissions, (b) exposure atmospheres, (c) effective dose to critical tissues, and (d) health effects in man for various scenarios of diesel vehicle production and deployment.

16125 **(RHO-SA—190) Energy is good for your health: a plea for completeness in health-impact assessments.** Wood, D.E. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Oct 1980. Contract AC06-77RL01030. 8p. (CONF-801107—65). NTIS, PC A02/MF A01.

From ANS international conference; Washington, DC, USA (17 Nov 1980).

More complete risk assessments of the relative impact of energy choices could provide a more rational basis for selecting future energy strategies. This discussion considers the extension of impact assessment techniques as an aid to achieving improved public understanding of the options, including the option of less energy. (ACR)

16126 **(UCRL—85599) Environmental impacts of the production and utilization of carbonaceous fuels: a brief overview.** Stuermer, D.H.; Tompkins, M.A. (Lawrence Livermore National Lab., CA (USA)). 1980. 10p. (CONF-801249—1). NTIS, PC A02/MF A01.

From DOE workshop on basic research in organic geochemistry applied to national energy needs; St Petersburg, FL, USA (15 Dec 1980).

The projected increased future use of fossil fuels over the next several decades will intensify many of the current environmental concerns. These concerns include the following: contamination of water resources; consequences of various solid and liquid waste disposal alternatives; atmospheric input of organic emissions, SO/sub x/, NO/sub x/, particulates, smog forming products, and associated acid rains; increased global atmospheric CO_2 concentrations; and, spills of crude and synthetic oils and their refined products. The development of oil shale, coal, tar sands, and enhanced oil recovery (EOR) resources will have regional impacts related to the distribution of the resources.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

16127 **Species near its equilibrium size in a fluctuating environment can evolve a lower intrinsic rate of increase.** Heckel, D.G.; Roughgarden, J. (Standord Univ., CA). Contract ER-76-S-03-0326. *Proceedings of the National Academy of Sciences of the United States of America ;* **77**: No. 12, 7497-7500(Dec 1980).

In one specific model of a density-regulated population undergoing natural selection in a fluctuating environment there is a systematic evolutionary pressure favoring a lower intrinsic rate of increase, which can sometimes even overcome an evolutionary pressure favoring a higher carrying capacity.

16128 **Maze training alters brain weights and cortical RNA/DNA ratios.** Bennett, E.L. (Lawrence Berkeley Lab., CA); Rosenzweig, M.R.; Morimoto, H.; Hebert, M. *Behavioral and Neural Biology ;* **26**: 1-22(1979).

In order to test whether training leads to anatomical and chemical changes in the brain, individual rats were given self-paced trials in mazes, traversing the maze in order to get from a food station to a water station. In 30 days of this training, during which they had no social interaction, the rats developed significant increases in weight and RNA/DNA of standard samples of cerebral cortex, as compared with littermate rats in either of two control conditions: (a) rats confined to small individual cages (N = 70 per condition); (b) rats that traversed the empty maze box with no maze barriers present (N = 29 per condition). Whereas the rats who faced maze problems decreased average transit times through the maze on successive trials, the rats that traversed the empty box showed no regular trend in running times over trials. The cerebral effects of maze experience versus control conditions were similar in pattern but were smaller in magnitude than effects of experience in a social group in a multisensory complex environment. This clear evidence of cerebral changes as consequences of maze training adds further support to the indications that similar cerebral changes resulting from enriched experience are due to learning rather than to other factors. The changes that follow training or enriched experience can be linked with other evidence concerning the roles of RNA and of protein synthesis in the formation of long-term memory traces.

5502 Biochemistry

REFER ALSO TO CITATION(S) 16128, 16150, 16162, 16163, 16199

16129 (PNL—3700(Pt.1), pp 226-234) **Metal-membrane interactions.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The ionic forms of most toxic metals penetrate cell membranes slowly, and their primary effects are probably exerted on control systems and enzymes in the cell membrane. Although entry of the toxic metals into the cells is poorly understood, it is probably mediated by specific transport systems in the plasma membrane. Information on the interaction of metals with defined membrane functions should therefore aid in predicting potential effects of trace metals derived from fossil-fuel combustion. During the past year, we have purified an acid protease secreted by Neurospora, and have discovered that it is secreted in response to deprivation of carbon, sulfur or nitrogen, and induction by protein, and that it is regulated by conversion to an alternate form by acidic medium. A highly sensitive and specific assay was developed for another (pepsin-like) acid protease secreted by Neurospora in response to starvation, and the enzyme was partially purified and characterized.

16130 **Copper site of molluscan oxyhemocyanins. Structural evidence from x-ray absorption spectroscopy.** Co, M.S. (Stanford Univ., CA); Hodgson, K.O.; Eccles, T.K.; Lontie, R. *Journal of The American Chemical Society ;* **103**: No. 4, 984-986(25 Feb 1981).

Analysis of the extended x-ray absorption fine structure led to the proposal of a model for the binuclear type 3 copper site in which the Cu atoms are separated by 3.55 A. Results on oxyhemocyanins from two different species (Megathura crenulata and Helix pomatia) are compared. (DLC)

16131 **Metalloprotein EXAFS. A group fitting procedure for imidazole ligands.** Co, M.S.; Scott, R.A.; Hodgson, K.O. (Stanford Univ., CA). *Journal of The American Chemical Society ;* **103**: No. 4, 986-988(25 Feb 1981).

A method was developed for fitting the extended x-ray absorption fine structure of a rigid multiatom ligand as a whole (group fitting) and its utility tested for fitting imidazole ligands to copper atoms in several copper proteins. Three tetrakis (imidazolato) copper (II) compounds (nitrate, perchlorate, sulfate) were studied. The group fitting technique was applied to some histidine-containing copper proteins. (DLC)

16132 **Crystallization of yeast triose phosphate isomerase from polyethylene glycol.** Alber, T. (Massachusetts Inst. of Tech., Cambridge); Hartman, F.C.; Johnson, R.M.; Petsko, G.A.; Tsernoglou, D. Contract W-7405-ENG-26. *Journal of Biological Chemistry, The ;* **256**: No. 3, 1356-1361(10 Feb 1981).

A new crystal form of yeast triose phosphate isomerase has been grown from solutions of the enzyme in polyethylene glycol (PEG) of average molecular weight 4000. The crystals are monoclinic, space group $P2_1$, with a = 61.3 A, b = 98.4 A, c = 49.7 A, β = 90.9°. There is one dimeric molecule per asymmetric unit. Data are observable to at least 1.3A resolution. Crystallization can be achieved after the protein is induced to oil-out by polyethylene glycol precipitation. Small oil droplets of protein act as nucleation centers for the growth of large single crystals. Measurements of the protein and polyethylene glycol content of the two phases of the yeast triose phosphate isomerase system establish that the protein

has gone entirely into the more dense phase. This phase also contains polyethylene glycol. Consideration of the behavior of this two-phase system suggests that polyethylene glycol precipitates proteins at least in part by competing for water of hydration.

16133 **Nuclear magnetic resonance of heme protein crystals.** Rothgeb, T.M.; Oldfield, E. (Univ. of Illinois, Urbana). *Journal of Biological Chemistry, The ;* **256**: No. 3, 1432-1446(10 Feb 1981).

A new technique capable of determining the static and dynamic structures of heme protein crystals is reported. It is shown that microcrystals of a variety of paramagnetic heme proteins, suspended in ~ 90% saturated $(NH_4)_2SO_4$, may be perfectly aligned by an intense static external magnetic field, H_0, due to the large anisotropy in the magnetic susceptibility of the protein caused by the paramagnetic center. The magnetic ordering method permits the recording of single crystal NMR spectra from microcrystalline arrays of proteins which cannot be prepared in large enough form (~ 1 cm^3) for single crystal NMR spectroscopy and thereby allows the resolution and assignment of numerous single atom sites in the crystalline solid state. The information from a single crystal NMR spectrum combined with that obtained on the crystal powder allows for the direct determination of (i) the spatial orientation of the particular labeled residue within the protein crystal and (ii) the rates and types of side chain motion. Resonances were assigned by spin label broadening experiments and by use of existing x-ray data to predict ^{2}H-NMR spectra. This new technique opens up the possibility of determining directly the dynamic structure of protein crystals and of comparing the structure of proteins in the crystalline solid state with that in solution and is applicable to other heme proteins, e.g., catalase.

16134 **Mitochondrial transcription complex from Saccharomyces cerevisiae.** Levens, D.; Morimoto, R.; Rabinowitz, M. (Univ. of Chicago, IL). Contract EY-76-C-02-0069. *Journal of Biological Chemistry, The ;* **256**: No. 3, 1466-1473(10 Feb 1981).

A DNA protein complex has been isolated from the mitochondria of Saccharomyces cerevisiae. The complex transcribes RNA complementary to mtDNA in a nonrandom manner. The RNA polymerase activity contained in the transcription complex is not dependent on the addition of exogenous template. The activity is rendered template-dependent by autolysis and can be further purified by heparin-Sepharose 4B chromatography. The activity is inhibited by heparin, Mn^{2+}, and increasing ionic strength. The activity requires Mg^{2+} and ribonucleotides. The preferred template for the template dependent activity is poly[d(AT)]. The majority of the RNA synthesized by the transcription complex from endogenous DNA is complementary to the DNA strands directing the synthesis of the large and small ribosomal RNA. In yeast the 21 S and 14 S rRNA genes are widely separated, therefore the transcription of these two regions but not of the intervening regions by the transcription complex suggests the existence of at least two transcriptional promoters on the yeast mitochondrial genome.

16135 **Primary structures of high potential, four-iron-sulfur ferredoxins from the purple sulfur photosynthetic bacteria, Thiocapsa roseopersicina and Chromatium gracile.** Tedro, S.M.; Meyer, T.E.; Bartsch, R.G.; Kamen, M.D. (Univ. of California, San Diego, La Jolla). Contract EY-76-S-03-0034. *Journal of Biological Chemistry, The ;* **256**: No. 2, 731-735(25 Jan 1981).

The amino acid sequences of high potential iron-sulfur proteins (HiPIP) from the purple sulfur photosynthetic bacteria Thiocapsa roseopersicina and Chromatium gracile were determined by alignment of tryptic peptides with the amino acid sequence of HiPIP from the closely related bacterium Chromatium vinosum, strain D. The two new sequences exhibit about 80% similarity to that of C. vinosum, but only an average of 33% similarity to the other known HiPIP species. Comparison of the three closely related sequences prompted a reinvestigation of the C. vinosum sequence, which resulted in three corrections, all involving changes of asparagine or aspartic acid to their respective acid or amide.

16136 **Alkaline protease from Neurospora crassa. Purification and partial characterization.** Lindberg, R.A.; Eirich, L.D.; Price, J.S.; Wolfinbarger, L. Jr.; Drucker, H. (Pacific Northwest Lab., Richland, WA). Contract AC06-76RLO;EY-76-C-06-1831. *Journal of Biological Chemistry, The ;* **256**: No. 2, 811-814(25 Jan 1981).

A simple purification procedure was developed for the extracellular alkaline protease from Neurospora crassa. Key steps in the purification were: (1) the choice of gelatin as the protein inducer, which induces optimally at a much lower concentration than other commonly employed protein inducers; (2) heat treatment, during which the inducer is digested by the protease; and (3) a concentration step that eliminates the usual precipitation procedures and removes much of the digested protein inducer. The preparation was homogeneous and had a molecular weight of ~ 30,500. The protease has 100% activity from pH 6.0 to 10.0, is heat labile above 45°C, and susceptible to autodigestion. Hydrolysis of the β chain from insulin indicates a preferential cleavage on the carboxyl group side of neutral and aromatic amino acids.

16137 **Concentration and metabolic turnover of UDP-glucose in developing cotton fibers.** Carpita, N.C. (Purdue Univ., West Lafayette, IN); Delmer, D.P. Contract AC02-76ERO-1338. *Journal of Biological Chemistry, The ;* **256**: No. 1, 308-315(10 Jan 1981).

The flow of carbon in vivo from glucose to cellulose in developing cotton fibers which were actively engaged in the deposition of a cellulosic secondary cell wall was traced. Steady state levels of nucleotide sugars were analyzed from developing cotton fibers harvested between 13 and 36 days post-anthesis (DPA). The UDP-sugars were the predominant nucleotide sugars. UDP-glucose constituted over 75% of the UDP-sugar fraction, but UDP-galactose and traces of other UDP-sugars were also detected. The UDP-glucose levels increased from 0.2 μmol/boll at 13 DPA to over 2.1 μmol/boll by 24 DPA, just prior to the maximum rate of secondary wall cellulose synthesis; the levels dropped precipitously at the time when cellulose synthesis ceased. Fibers, cultured in vitro possess a very similar nucleotide-sugar composition to that of plant-grown fibers. When such fibers are pulse-labeled in vivo with [^{14}C]glucose, UDP-glucose is the predominant nucleotide sugar labeled. Pool size and rates of labeling of glucose, glucose-phosphate, and UDP-glucose pool data were analyzed using a computer simulation model, and it was determined that the rate of synthesis and turnover of UDP-glucose is more than sufficient to account for the combined rates of accumulation of sucrose, sterylglucosides, β-1,3-glucan, and cellulose. These data strongly indicate that UDP-glucose is a precursor to secondary wall cellulose in the cotton fiber.

16138 **Sites of termination of in vitro DNA synthesis on ultraviolet- and N-acetylaminofluorene-treated phi X174 templates by prokaryotic and eukaryotic DNA polymerases.** Moore, P.D.; Bose, K.K.; Rabkin, S.D.; Strauss, B.S. (Univ. of Chicago, IL). *Proceedings of the National Academy of Sciences of the United States of America ;* **78**: No. 1, 110-114(Jan 1981).

In vitro DNA synthesis on a phi X174 template primed with a restriction fragment and catalyzed by the Escherichia coli DNA polymerase I large (Klenow) fragment (pol I) terminates at the nucleotide preceding a site that has been altered by ultraviolet irradiation or treatment with N-acetylaminofluorene. Termination on ultraviolet-irradiated templates is similar when synthesis is catalyzed by E. coli DNA polymerase III holoenzyme (pol III), phage T4DNA polymerase a polymerase α from human lymphoma cells, or avian myeloblastosis virus reverse transcriptase. 3′ → 5′ exonuclease activity cannot be detected in the reverse transcriptase and DNA polymerase α preparations. On N-acetylaminofluorene templates, pol I, pol III, and T4 polymerase reactions terminate immediately preceding the lesion, whereas reverse transcriptase-catalyzed reactions and, at some positions in the sequence, polymerase α-catalyzed reactions terminate at the site of the lesion. Substitution of Mn^{2+} for Mg^{2+} changes the pattern of pol I-catalyzed termination sites. The data sugest that termination is a complicated process that does not depend exclusively on the 3′ → 5′ exonuclease activity associated with many polymerases.

16139 Time-resolved protein fluorescence studies of intermediates in the photochemical cycle of bacteriorhodopsin. Fukumoto, J.M.; Hopewell, W.D.; Karvaly, B.; El-Sayed, M.A. (Univ. of California, Los Angeles). *Proceedings of the National Academy of Sciences of the United States of America ;* **78**: No. 1, 252-255(Jan 1981).

The photolysis-induced changes in the protein fluorescence intensity(at 320 nm) during the proton-pumping cycle of bacteriorhodopsin were examined by a delayed two-pulse technique in the time range 1 μsec-20 msec at room temperature. No detectable change in the protein fluorescence intensity was observed on the earliest time scale within the lifetime of the intermediate K_{590}, when retinal apparently undergoes the largest structural changes. The time dependence of the relative changes in fluorescence intensity did, however, display a close correlation with the population of L_{550} and M_{412} intermediates. From a computer numerical fit of the data, with available published kinetic parameters, the protein fluorescence quantum yields of the K_{590}, L_{550}, and M_{412} intermediates are found to be 1.0, 0.92, and 0.80 of that for native bR_{570}, respectively. The probable mechanisms of the observed fluorescence quenching during the photochemical cycle are qualitatively discussed.

16140 Intermediates of a polynuclear manganese center involved in photosynthetic oxidation of water. Dismukes, G.C.; Siderer, Y. (Princeton, Univ., NJ). *Proceedings of the National Academy of Sciences of the United States of America ;* **78**: No. 1, 274-278(Jan 1981).

Electron paramagnetic resonance of spinach chloroplasts given a series of laser flasnes, n = 0, 1, ..., 6, at room temperature and rapidly cooled to -140°C reveals a signal possessing at least 16 and possibly 21 or more hyperfine lines when observed below 35K. The spectrum is consistent with a pair of antiferromagnetically coupled Mn ions, or possibly a tetramer of Mn ions, in which Mn(III) and Mn(IV) oxidation states are present. The intensity of this signal peaks on the first and fifth flashes, suggesting a cyclic change in oxidation state of period 4. The multiline signal produced on the first flash is not affected by the electron transport inhibitor 3-(3,4-dichlorophenyl)-1,1-dimethylurea but is abolished by agents that influence the state of bound manganese, such as incubation with alkaline Tris, or dithionite, and by extraction with cholate detergent in the presence of ammonium sulfate. These results indicate that the paramagnetic signal is monitoring oxidation state changes in the enzyme involved in oxidation of water.

16141 Conformational characteristics of rigid cyclic nucleotides. 3. The solution conformation of β-lyxonucleoside cyclic 2',5'- and 3',5'-monophosphates and of α-arabinonucleoside cyclic 2',5'-monophosphates. Implications for evaluation of the solution properties of nucleoside analogues. MacCoss, M.; Ainsworth, C.F.; Leo, G.; Ezra, F.S.; Danyluk, S.S. (Argonne National Lab., IL). Contract W-31-109-ENG-38. *Journal of The American Chemical Society ;* **102**: No. 24, 7353-7361(19 Nov 1980).

A detailed ^{1}H 220-MHz NMR study has been made of 1-(β-D-lyxofuranosyl)uracil cyclic 3',5'-monophosphate (1a, 3',5'-cLUMP), 1-(β-D-lyxofuranosyl)-5,6-dihydrouracil cyclic 3',5'-monophosphate (1b, 3',5'-cLDHUMP), 1-(β-D-lyxofuranosyl)uracil cyclic 2',5'-monophosphate (2a, 2',5'-cLUMP, 1-(β-D-lyxofuranosyl)-5,6-dihydrouracil cyclic 2',5'-monophosphate (2b, 2',5'-cLDHUMP), and 9-(α-D-arabinofuranosyl)adenine cyclic 2',5'-monophosphate (3, α-2',5'-cAAMP) in D_2O solution. Conformational analyses showed the cyclic 2',5'-phosphates (2a,b and 3) to exhibit sugar conformations in the range of ^{2}E whereas the cyclic 3',5'-phosphates (1a,b) showed a preference for the ^{3}E to $_4{}^3$T conformation. The unusually large ^{3}J/sub PH/ coupling of ~ 31 Hz which had previously been observed for J/sub 5'P/ in 9-(β-D-arabinofuranosyl)adenine cyclic 2',5'monophosphate (2c, 2',5'-cAAMP) and for 1-(β-D-arabinofuranosyl)cytosine cyclic 2',5'-monophosphate (2d, 2',5'-cACMP) was again apparent in 2a,b but not in 3. This difference is attributed to a steric interaction between the β-oriented base and the cyclic 2',5'-phosphate ring in 2a-d, which is not present in 3 where the base is oriented α; this allows the phosphate ring to take up a less-strained conformation to that in 2a-d. The cyclic phosphate rings of the compounds described in this study fix the sugar rings into a particular conformation, precluding the ^{2}E reversible ^{3}E conformer equilibrium usually found in acyclic mononucleotides. In the cases of 1a and 2a, this permits an accurate evaluation of the solution properties of the parent lyxonucleoside and the conformations of lyxouridine and lyxoadenosine are shown to be different from a ^{3}E/$_4{}^3$T reversible $_1{}^2$T/$_3{}^2$T equilibrium predicted earlier for lyxouridine. Furthermore, a detailed NMR examination has been made of the 2a → 1a isomerization in aqueous solution, and a mechanistic rationale is proposed.

16142 Inhibitor of uracil-D10 NA glycosylase induced by bacteriophage PBS2. Cone, R.; Bonura, T.; Friedberg, E.C. (Stanford Univ., CA). Contract EY-76-S-03-0326. *Journal of Biological Chemistry, The ;* **255**: No. 21, 10354-10357(10 Nov 1980). .

A PBS2 phage-coded inhibitor of uracil-DNA glycosylase activity from Bacillus subtilis has been purified extensively and characterized preliminarily. The inhibitor has a relative S value of 1.44 +- 0.08 measured by sedimentation in 15 to 40% glycerol density gradients. It is unusually stable to heating and to the presence of sodium dodecyl sulfate and/or 8 M urea. The inhibitor has no known cofactor requirement and is active in the presence of 10 mM EDTA. Inhibitor activity is sensitive to digestion with proteinase K, but is insensitive to DNase or RNase digestion. The purified inhibitor behaves anomalously during electrophoresis in polyacrylamide gels containing sodium dodecyl sulfate; however, experiments designed to show that the inhibitor is a glycoprein were negative. The inhibitor clearly contains a protein required for activity, however, the possibility that some other molecular component is part of the active inhibitor cannot be excluded.

16143 Changes in mitochondrial DNA in cardiac hypertrophy in the rat. Rajamanickam, C.; Merten, S.; Kwiatkowska-Patzer, B.; Chuang, C.H.; Zak, R.; Rabinowitz, M. (Univ. of Chicago, IL). Contract EY-76-C-02-0069. *Circulation Research. An Official Journal of the American Heart Association ;* **45**: No. 4, 505-515(Oct 1979).

We studied DNA (mtDNA) replication in adult female rat hearts undergoing hypertrophy secondary to constriction of the ascending aorta. MtDNA was measured in isolated mitochondria by a fluorometric method adapted for that purpose. The mtDNA concentration in mitochondria, expressed as micrograms of DNA per milligram of mitochondrial protein, increased 2, 4, and 7 days postoperatively by 21, 73, and 98%, respectively. The population of replicative intermediates of mtDNA was analyzed by electron microscopy. In normal hearts, we observed molecular forms characteristic of animal mtDNA. D-loop frequency, which was near 50% in the mtDNA of control hearts, was markedly reduced to 5-7% in hypertrophying hearts. This result indicates that the increase in replicative flux of mtDNA is associated with the removal of a block in the conversion of D-loops to other intermediates.

16144 Absorption changes of P-700 reversible in milliseconds at low temperature in Triton-solubilized Photosystem I particles. Sauer, K.; Mathis, P.; Acker, S.; Van Best, J.A. (Centre d'Etudes Nucleaires, de Saclay, Gif-sur-Yvette, France). *Biochimica et Biophysica Acta ;* **545**: 466-472(1979).

Triton-solubilized Photosystem I particles from spinach chloroplasts exhibit largely reversible P-700 absorption changes over the temperature range from 4.2°K to room temperature. For anaerobic samples treated with dithionite and neutral red at pH 10 and illuminated during cooling, a brief (1 μs) saturating flash produces absorption changes in the long wavelength region that decay in 0.95 +- 0.2 ms from 4.2 to 50°K. Above 80°K a faster (100 +- 30 μs) component dominates in the decay process, but this disappears again above about 180°K. The major decay at temperatures above 200°K occurs in about 1 ms. The difference spectrum of these absorption changes between 500 and 900 nm closely resembles that of P-700. Using ascorbate and 2,6-dichlorophenolindophenol as the reducing system with a sample of Photosystem I particles cooled in darkness to 4.2°K, a fully reversible signal is seen upon both the first and subsequent flashes. The decay time in this case is 0.9 +- 0.3 ms.

16145 Drug interactions with DNA. Sobell, H.M. pp 145-160 of Effects of drugs on the cell nucleus. New York, NY; Academic Press, Inc. (1979).

The subject of drug intercalation is a multidimensional one in that it concerns itself with understanding the dynamic nature of the DNA double helix and the structural nature of its flexibility. Our x-ray crystallographic studies on drug intercalation have led us to propose the existence of phonon (wave) energy in DNA structure. This concept allows us to understand the origin of premelting changes in DNA structure that lead to DNA breathing and to drug intercalation. Such premelting phenomena may also be related to understanding the nature of a large number of protein-DNA interactions. Thus promoters are envisioned to be permanently premelted DNA breathing regions recognized (in part) through partial or complete intercalation by the RNA polymerase enzyme. Histones may have evolved to control this DNA activation process through a flip-flop mechanism in which inactive DNA (k-kinked B DNA) is converted into active DNA (β-kinked DNA) through the use of topological constraints. Nucleases may have evolved to see kinks in DNA, perhaps by partially (or, in some cases, completely) intercalating aromatic side chains into DNA.

16146 **New synthesis of 2-deoxy-D-arabino-hexose.** Shiue, C.Y.; MacGregor, R.R.; Lade, R.E.; Wan, C.N.; Wolf, A.P. (Brookhaven National Lab., Upton, NY). *Carbohydrate Research ;* **74**: 323-326(1979).

2-Deoxy-D-arabino-hexose (7) has been widely used as a D-glucose analog in the study of various aspects of carbohydruate transport and metabolism. During the course of developing labeled tracers to serve as probes for the measurement of local D-glucose metabolism in man, we required a synthesis that could conveniently be adapted for the preparation of 7 labeled at C-1 with an isotopic carbon atom (^{11}C, ^{13}C, or ^{14}C). Although a number of syntheses of 7 have been published, none appeared suitable for our purpose. We therefore investigated a new route to synthesize 2-deoxy-D-arabino-hexose.

16147 **Thionein gene expression in Cd^{++}-variants of the CHO cell: correlation of thionein synthesis rates with translatable mRNA levels during induction, deinduction, and superinduction.** Enger, M.D.; Rall, L.B.; Hildebrand, C.E. (Los Alamos Scientific Lab., NM). *Nucleic Acids Research ;* **7**: No. 1, 271-288(1979).

The relationship of thionein synthesis rates to translatable cytoplasmic thionein mRNA levels was investigated for the first time in a cultured cell system. Thionein synthesis was induced in Cd/sup r/, a cadmium-resistant variant of CHO, by exposure to 2 μM $CdCl_2$. Following a short lag, thionein synthesis increases to a rate that is at least 30 times the uninduced rate 7-8 hr after addition of Cd^{++}. This increase is blocked by the coincident addition of actinomycin D. Cytoplasmic thionein mRNA levels increase rapidly following induction to values approximately 25 times uninduced levels within 6-8 hr. The increases in thionein mRNA precede proportionate increases in thionein synthesis by 0.5-1.0 hr. Continued exposure to Cd^{++} results in a decreased thionein synthesis rate after 8 hr. Removal of Cd^{++} after 8 hr results in a rapid decrease in thionein synthesis. Both decreases are inhibited by the addition of actinomycin. The results suggest that thionein synthesis in Cd/sup r/ is controlled primarily by the level of translatable cytoplasmic thionein mRNA.

16148 **Structural polymers of the primary cell walls of dicots.** McNeil, M.; Darvill, A.G.; Albersheim, P. (Univ. of Colorado, Boulder). pp 191-249 of Progress in the chemistry of organic natural products. 37. Herz, W.; Grisebach, H.; Kirby, G.W. (eds.). New York, NY; Springer-Verlag (1979).

This review has stressed the need to isolate and chemically characterize the structures of the polymers of primary cell walls. Emphasis must be placed on working with cell wall polymers rather than with polymers obtained from other tissues and organelles. It is also important to obtain polymers from homogeneous preparations of primary cell walls rather than from walls isolated from tissues containing a mixture of wall types. Much of the early work on characterizing cell wall polymers was done with heterogeneous wall preparations. The availability of easily grown suspension-cultured cells offers the possibility of working with homogeneous preparations of primary cell walls. It is hoped that, the structural work of the future will be done with undifferentiated suspension-cultured cells or with other sources of homogeneous primary cell walls.

16149 **Construction of Tygon manifolds and connectors.** Anderson, N.G. (Argonne National Lab., IL). *Analytical Biochemistry ;* **86**: No. 1, 337-338(May 1978).

Complex manifolds are required to arrange and control flow of liquids during the loading and unloading of zonal centrifuges, in vaccine production using the continuous-sample-flow-with-banding K-type centrifuge, in rapid recycling affinity chromatography, in continuous flow analyzers, and in a variety of devices and systems using density gradients. In many instances permanent metal manifolds or valves are to be avoided because they are expensive to fabricate, are difficult to clean, and may accumulate sediments and microorganisms which are not observed because they are opaque. Glass manifolds are fragile and are not easily made by the uninitiated. Connections between plastic tubing and glass may separate under pressure, especially when detergents are present. The advantages of using plastic tubing, and hemostats in place of valves to control complex flow patterns, have been previously stressed. A simple solution to the problems of manifolds of metal or glass is to use various sizes of Tygon tubing cemented together with cyclohexanone containing approximately 5 to 10% dissolved Tygon. Very small tubing (less than 1/8-in. i.d.) may be clogged by the cement and should be cleared of liquid cement with low-pressure air. Very large pieces of Tygon tubing may need to be held in place with clamps or jigs until the cement has set. These Tygon manifolds have been found very resistant to tearing and easily cleaned and replaced.

5503 Cytology

REFER ALSO TO CITATION(S) 16137, 16165, 16199

16150 **Growth regulation, reverse transformation, and adaptability of 3T3 cells in decreased Mg^{2+} concentration.** Rubin, H. (Univ. of California, Berkeley). *Proceedings of the National Academy of Sciences of the United States of America ;* **78**: No. 1, 328-332(Jan 1981).

A nontransformed and a spontaneously transformed clone of BALB/c 3T3 cells were compared for their capacity to multiply in decreased concentrations of Mg^{2+}. Cells of the nontransformed clone were flat, formed regularly patterned, nonoverlapping arrays, required high serum concentration for multiplication, had a low saturation density, and did not make colonies in agar. Cells of the transformed clone were slender and spiky, formed random, overlapping arrays, multiplied in low serum concentrations, and had no fixed saturation density, and 20 to 30% of them formed colonies in agar. The saturation density of the nontransformed clone was decreased in a growth-limiting supply of Mg^{2+} in proportion to the reduction in initial rate of multiplication. At very low Mg^{2+} concentrations, saturation occurred when less than half of the surface of the dish was covered with cells. The transformed cells did not reach a stable saturation density in low Mg^{2+} concentrations, but their growth rate did slow down when they became crowded, and a transient saturation density was reached at the lowest Mg^{2+} concentrations that allowed multiplication. Limiting the supply of Mg^{2+} caused the transformed cells to flatten and to assume a regularly patterned, nonoverlapping relationship to one another, resembling that of the nontransformed cells. This also occurred in BALB/c 3T3 cells transformed by infection with Moloney mouse sarcoma virus. After 1 week in low concentrations of Mg^{2+}, the nontransformed cells began to multiply and to incorporate [^{3}H]thymidine at a rapid rate. The transformed cells did so also and, in addition, reverted to their transformed appearance. The intracellular content of Mg^{2+} was not significantly decreased when the extracellular concentration was decreased to 1/50th.

16151 **Culture systems for studying malignancy.** Bissell, M.J. (Lawrence Berkeley Lab., CA); Bartholomew, J.C.; Folkman, J.; Smith, H.; Stampfer, M. Contract W-7405-ENG-48. *Cancer Research ;* **39**: 4293-4295(Oct 1979).

This paper is a meeting report of an international symposium on culture systems for studying malignancy. The four sessions of the symposium dealt with properties of transformed cells, the mechanisms of carcinogenesis, human cell systems and differentiation and malignancy. (KRM)

16152 **Cell cycle of spermatogonia in mouse testis.** Fabrikant, J.I. (Lawrence Berkeley Lab., CA). Contract EY-76-S-02-3013; W-7405-ENG-48. *Investigative Radiology ;* **14**: No. 2, 189-191(Mar 1979).

This report measures the spermatogonial cell cycles and their constituent phases of proliferating type A, intermediate (In), and type B cells in the testis of the young mouse, and analyzes the cell cycle and cell population kinetic parameters, such as growth fractions and cell-birth rates, from ^{3}HTdR autoradiographic data.

16153 **Anti-tissue antibodies and immunoglobulin levels in relation to HLA and other markers in Icelandic families.** Williamson, N. (Univ. of Birmingham, England); Edwards, J.H.; Monk, K. *Journal of Immunogenetics ;* **6**: 223-244(1979).

Studies of sera from the Icelandic cousin marriage project were made to assess the incidence of various anti-tissue antibodies and the levels of immunoglobulins, as these were considered to be useful markers of the humoral immune response. Comparisons were made between these parameters and the HLA-A and B antigens, the blood groups, the immunoglobulin allotypes, the properdin factor (Bf), and other markers. Because the immune response may be expected to differ for each individual and depend at least in part, on the degree of exposure to different antigens, no absolute correlation was expected. There was, however, a marked association between certain IgG anti-tissue antibodies and HLA antigens. There were also some associations between immunoglobulin levels and ABO blood groups.

16154 **Binding site model of membrane transport: binary and cooperative flows.** Lee, M.H.; Berker, A.N.; Stanley, H.E.; Essig, A. (Massachusetts Inst. of Technology, Cambridge). Contract AS09-77ER-01023. *Journal of Membrane Biology ;* **50**: 205-224(1979).

The flows of solute molecules in a membrane under the influence of concentration gradients are considered within the framework of classical physical theories. A lattice model is constructed in which the binding sites represent potential minima and the flows are regarded as a result of molecules' making discrete transitions between the binding sites. Expressions for two-component currents are derived from certain descriptions for the transition mechanism. Our result applies to a combination of flows of tracer and abundant species as well as, more generally, to any combination of flows of two components which are distinguishable yet kinetically similar. Also considered are binary currents whose transport mechanism is further controlled by allosteric cooperativity. Whether the cooperative control is short or long ranged, permeability coefficients and fluxes differ appreciably from those without cooperative control. Numerical evidence suggests that the permeability and coupling may have discontinuous behavior, possibly indicating the existence of phase transitions. Our lattice model, from which the formulations for the flows are obtained, is compatible with current concepts of membrane structure.

16155 **Properties of epithelial cells cultured from human carcinomas and nonmalignant tissues.** Smith, H.S. (Univ. of California, Berkeley); Hackett, A.J.; Riggs, J.L.; Mosesson, M.W.; Walton, J.R.; Stampfer, M.R. Contract W-7405-ENG-48. *Journal of Supramolecular Structure ;* **11**: 147-166(1979).

Human epithelial cell cultures were examined for expression of plasminogen activator and fibronectin matrix. All of the cells examined showed ultrastructural evidence suggesting their epithelial origin, including microvilli and specialized junctions. The nonmalignant cells were also negative for endothelial cell markers. The nonmalignant lines all produced large amounts of plasminogen activator, whereas the tumor-derived lines showed a gradation of activities, ranging from lines having as much activity as the nonmalignant lines to lines having little or no activity above background. For both normal and malignant cells, addition of dexamethesone only slightly decreased the levels of plasminogen activator.

16156 **Freeze-fracture scanning electron microscopy of Lemna minor L. (duckweed).** Echlin, P.; Pawley, J.B.; Hayes, T.L. (Lawrence Berkeley Lab., CA). *Scanning Electron Microscopy ;* **3**: 69-76(1979).

A detailed study has been carried out on the frozen fracture faces of plant material. Roots of Lemna minor are encapsulated in different nonpenetrating polymeric cryoprotectants, rapidly cooled in melting nitrogen and transferred to the pre-cooled cold stage of the AMR Biochamber. The technique has been used to follow the course of development of the phloem tissue in the root tip. These studies have shown that the phloem parenchyma appears to develop in a regular sequence. Unetched surfaces are virtually featureless, and it is necessary to remove a surface layer of water in order to visualize the biological structure. The amount of water sublimed from the fractured surface is a function of both the time of etching and the water binding capacity of the cell contents. It is not possible to etch cells infiltrated with a penetrating cryoprotectant as the glycerol-water eutectic is stable at low temperatures and no water is lost from the fractured surface. Several distinct stages have been observed during the etching process.

16157 **Fluorescent DNA probes for flow cytometry: considerations and prospects.** Crissman, H.A.; Orlicky, D.J.; Kissane, R.J. (Los Alamos Scientific Lab., NM). *Journal of Histochemistry and Cytochemistry, The ;* **27**: No. 12, 1652-1654(1979).

Techniques employing base specific deoxyribonucleic acid (DNA)-binding fluorochromes and flow cytometry (FCM) are potentially useful for obtaining information of the compositional features of chromatin or chromosomes of mammalian cells. Fluorescent compounds which form complexes preferentially at the A-T rich regions or the G-C rich regions in DNA are available and compatible with current FCM technology as are other compounds which show little or no base specificity and bind by intercalation in the double stranded regions of helical DNA. Since extrinsic fluorescent probes provide only a measure of available binding sites or regions unobstructed by chromatin-associated or chromosomal-associated proteins, interpretations of fluorescence measurements need to be substantiated by adequate control measures.

16158 **Electrical impedance analysis of single murine teratocarcinoma cells.** Hoffman, R.A.; Swartzendruber, D.E. (Los Alamos Scientific Lab., NM). *Experimental Cell Research ;* **122**: 426-429(1979).

Single murine teratocarcinoma cells were analyzed by a new flow instrument that simultaneously measures the volume and high-frequency electrical impedance of individual cells at rates of several hundred cells per second. Differentiated cells were found to have larger high-frequency impedance than undifferentiated stem cells of the same size.

16159 **Termination of acquired and natural immunological tolerance with specific complexes.** Habicht, G.S.; Chiller, J.M.; Weigle, W.O. (Scripps Clinic and Research Foundation, La Jolla, CA). *Journal of Experimental Medicine ;* **142**: 312-320(1975).

The termination of an induced unresponsive state can be achieved by immunizing tolerant animals with antigens which cross-react with the tolerated antigen. Data suggest that at 3 months of age, rabbits made tolerant at birth by the injection of large amounts of bovine serum albumin (BSA) possess a normal anti-BSA antibody-forming potential. A cellular interpretation for this phenomenon can be formulated whereby tolerance to BSA at the time of testing is maintained by the functional absence of the BSA-specific carrier recognition mechanism (T cells) in spite of the presence of B cells capable of responding to the antigen. Tolerance could, therefore, be terminated at a time when unresponsiveness to BSA is restricted to specific T cells by using a complex composed of the tolerogen (BSA) conjugated to a carrier molecule. The results demonstrate that such complexes can terminate tolerance.

5504 Genetics

REFER ALSO TO CITATION(S) 16219

16160 **(UR—3490-1980) Spontaneous mitotic recombination in the mms8-1 mutant of Saccharomyces cerevisiae.** Montelone, B.A.; Prakash, S.; Prakash, L. (Rochester Univ., NY (USA)). 1979. 28p. NTIS, PC A03/MF A01.

The MMS sensitive mutation mms8-1 increases the rate of spontaneous mitotic intragenic recombination at five heteroallelic loci on three chromosomes. Complementation, segregation, and mapping studies indicate that mms8-1 is allelic to cdc9, known to be defective in DNA ligase. Both mms8-1 and cdc9 mutants are lethal in combination with the recombination defective mutant rad52-1. Genetic analysis of spontaneous red/white sectors in an ade2-1/ade2-1 ade5/+ mms8-1/mms8-1 strain shows non-reciprocal recombinational events involving long chromosome segments. We also observe increased rates of simultaneous recombination at loci on different chromosomes in both wild type and mms8-1 mutants.

16161 **Folate-dependent enzymes in cultured Chinese hamster ovary cells: evidence for mutant forms of folylpolyglutamate synthetase.** Taylor, R.T.; Hanna, M.L. (Lawrence Livermore Lab., CA). Contract W-7405-ENG-48. *Archives of Biochemistry and Biophysics ;* **197**: No. 1, 36-43(1 Oct 1979).

A Chinese hamster ovary auxotroph requiring glycine + adenosine + thymidine CHO AUXB1) was shown by us previously to lack several folylpolyglutamate synthetase (FPGS) type activities. Two revertants of AUXB1 have been isolated and found to contain altered forms of this enzyme. The revertant enzymes are more sensitive to heat inactivation than the parent CHO enzyme. ATP and $MgCl_2$ protect both revertant and parent CHO FPGS against rapid heat denaturation at pH 9.0, but not at pH 7.4. A genetically related auxotroph (CHO AUXB3) contains one-fifth the parent amount of FPGS. Unlike the FPGS from parent CHO and a genetically unrelated mutant requiring only glycine (CHO AUXB2), the AUXB3 enzyme specifically lacks tetrahydropteroyltetra[U-^{14}C]glutamate synthetase activity. These findings and polyethylene glycol fusion data with AUXB2 indicate that AUXB1 and AUXB3 each carry a mutation in the structural gene for a CHO FPGS that catalyzes tetrahydropteroyldi- as well as tetraglutamate formation. The altered form of FPGS in AUXB3 is responsible for its glycine + adenosine auxotrophy under standard culture conditions.

16162 **Chromosomal DNA replication in higher plants.** Van't Hof, J.; Bjerknes, C.A. (Brookhaven National Lab., Upton, NY). *Bioscience ;* **29**: No. 1, 18-22(Jan 1979).

Replicon-size estimations from DNA fiber autoradiograms must always be considered with the limits of resolution in mind. However, data from yeast obtained by autoradiography and electron-microscopy gave similar average sizes in the 20 to 30 μm range. These sizes are in agreement with those of C. capillaris observed in the present work, with those of Pisum sativum and Helianthus annuus, and with those of four other unrelated plant species. The curious fact that higher plants and yeast have replicons of about the same size raises the question of whether or not all members of the plant kingdom share this common statistic. Higher plants appear to have a common replicon size, and they also have a slower fork rate than either bacteria or mammalian cells when grown at optimal temperatures. Even at 38° sunflower (Helianthus annuus) root meristem cells have a fork rate a little less than 12 μm per hour. On the other hand, at about the same temperature, the rate is approximately 800 μm per hour in bacteria, and in mammalian cells it ranges from 30 to 60 μm per hour. Current data from higher plants show that they have a range in fork rate from 6 to 12 μm per hour. The lower rates observed among higher plants are similar to and more often less than those reported for the amphibians Triturus and Xenopus and that of fatheat minnow cells. Therefore, higher plants and cold-blooded animals commonly share the characteristic of a relatively low replication fork rate.

16163 **Survey and mapping of restriction endonuclease cleavage sites in bacteriophage T7 DNA.** Rosenberg, A.H. (Brookhaven National Lab., Upton, NY); Simon, M.N.; Studier, F.W.; Roberts, R.J. *Journal of Molecular Biology ;* **135**: 907-915(1979).

A survey of restriction endonucleases having different cleavage specificities has identified 10 that do not cut wild-type bacteriophage T7 DNA, 11 that cut at six or fewer sites, four that cut at 18 to 45 sites, and 12 that cut at more than 50 sites. All the cleavage sites for the 13 enzymes that cut at 26 or fewer sites have been mapped. Cleavage sites for each of the 10 enzymes that do not cut T7 DNA would be expected to occur an average of 9 to 10 times in a random nucleotide sequence the length of T7 DNA. A possible explanation for the lack of any cleavage sites for these enzymes might be that T7 encounters enzymes having these specificities in natural hosts, and that the sites have been eliminated from T7 DNA by natural selection. Five restriction endonucleases were found to cut within the terminal repetition of T7 DNA; one of these, KpnI, cuts at only three additional sites in the T7 DNA molecule. The length of the terminal repetition was estimated by two independent means to be approximately 155 to 160 base-pairs.

16164 **Selection and recombination in populations containing tandem multiplet genes.** Koch, A.L. (Argonne National Lab., IL). Contract W-31-109-ENG-38. *Journal of Molecular Evolution ;* **14**: 273-285(1979).

Computer simulation for selective conditions that may apply in nature yielded three generalizations for prokaryotic organisms with recombinant mechanisms. (1) Selective forces can suffice to maintain a tandem gene family with the nearly optimum number of genes with little variance within the population. (2) Tandem genes will occur within the population unless the population is frequently cloned or unless the function due to a single copy is capable of over-providing the needs of the organism. (3) Even when there is no selective advantage or disadvantage due to extra gene copies, the population distribution becomes more skewed with time; and organisms with only single copies of the gene comprise a progressively larger fraction of the total. This may be the case with genes that function under strong cellular regulation. Evolutionary implications of these calculations are that the occurrence of unequal recombination of tandem genes would greatly slow evolution via duplication of genetic material. This difficulty and its possible resolutions are discussed.

5506 Medicine

REFER ALSO TO CITATION(S) 16202

16165 **Lactoferrin: its role as a Ga-67-binding protein in polymorphonuclear leukocytes.** Weiner, R.; Hoffer, P.B.; Thakur, M.L. (Yale University School of Medicine, New Haven, CT). Contract AS02-78EV04625;EP-78-S-02-4625. *Journal of Nuclear Medicine ;* **22**: No. 1, 32-37(Jan 1981).

From 28. annual meeting of Society of Nuclear Medicine; Las Vegas, NV, USA (16 Jun 1981).

Gallium-67 bound to lactoferrin - an iron-binding protein found in high concentration in polymorphonuclear leukocytes - has been isolated from PMNs that have previously been incubated with Ga-67 citrate. Although the cell-labeling efficiency was highly variable (0.026-10%), much of the activity that did bind to the PMNs (74.8 +- 10%) was recovered in the supernatant after sonication and centrifugation. About half (approx. 47%) of the PMN-bound activity was retained after dialysis and was presumably bound to macromolecules in the supernatant. When this retained activity was placed on a column containing immobilized antilactoferrin antibody, almost three quarters of the activity was bound to the column. This bound activity was (36 +- 17%) of the total activity absorbed by the PMN. The addition to the antilactoferrin column of a known antigen-antibody-dissociating agent caused the dissolution of the complex. No significant activity was bound to a control column. The findings indicate that lactoferrin is a major Ga-67-binding protein present in PMNs and suggest that it may play a major role in Ga-67 localization in an abscess. These results support the contention that molecules binding ferric iron have an important effect on Ga-67 distribution in vivo.

16166 **(DOE/EV/02541—1) Applications of CdTe to nuclear medicine. Annual report, February 1, 1979-January 31, 1980.** Entine, G. (Radiation Monitoring Devices, Inc., Watertown, MA (USA)). 1980. Contract AC02-76EV02541. 10p. NTIS, PC A02/MF A01.

The application of CdTe gamma detectors in nuclear medicine is reported on. An internal probe was developed which can be inserted into the heart to measure the efficiency of various radiopharmaceuticals in the treatment of heart attacks. A second application is an array of detectors which is light enough to be worn by ambulatory patients and can measure the change in cardi-

ac output over an eight hour period during heart attack treatment. The instrument includes an on board tape recorder. (ACR)

16167 **Imaging the inflammatory response to acute myocardial infarction in man using indium-111-labeled autologous platelets.** Davies, R.A.; Thakur, M.L.; Berger, H.J.; Wackers, F.J.T.; Gottschalk, A.; Zaret, B.L. (Yale Univ. School of Medicine, New Haven, CT). Contract EY-76-S-02-4078. *Circulation ;* **63**: No. 4, 826-832(Apr 1981).

The feasibility of imaging the inflammatory response to acute transmural myocardial infarction in man using indium-111 (^{111}In)-labeled autologous leukocytes was assessed in 36 patients. Indium-111 leukocytes were injected i.v. 18 to 112 hs after the onset of chest pain. Cardiac imaging was performed 24 hs later with a mobile gamma camera. Twenty-one patients had positive images and 15 had negative images. The percent of positive images increased as the interval between infarction and ^{111}In-leukocyte injection shortened; all patients injected within 24 hs of infarction had positive images. Patients with positive images were injected with ^{111}In leukocytes earlier after infarction and were younger than those with negative images. Several other parameters that could possibly have affected the imaging results were examined and were not significantly different in patients with positive and negative images. These included peak serum creatine kinase, location of infarction, incidence of pericarditis, use of antiinflammatory drugs or membrane-active antiarrhythmic drugs, peripheral leukocyte count, and cell labeling efficiency. The function of the labeled cells was similar in patients with positive and negative images. Six patients with acute infarction serving as controls and given free ^{111}In-oxine and six patients with stable coronary artery disease given ^{111}In-leukocytes all had negative cardiac images.

16168 **Ruthenium-97 DTPA: a new radiopharmaceutical for cisternography.** Oster, Z.H.; Som, P.; Fairchild, R.G. (Brookhaven National Lab., Upton, NY). *Journal of Nuclear Medicine ;* **22**: No. 3, 269-273(Mar 1981).

Ruthenium-97 DTPA (diethylenetriamine penta-acetic acid) was evaluated for its possible use as a cerebrospinal fluid imaging agent. Ru-97 has favorable physical properties that are highly suitable for imaging: decay by electron capture; gamma energy = 216 keV, 85%; T/sub 1/2/ = 2.9 days. Dogs were injected with 0.4 mCl Ru-97 DTPA or In-111 DTPA into the cisterna magna. The movement of the agents was monitored with a camera interfaced to a computer, or with a dual-probe system placed over the head and urinary bladder. In addition, blood and urine samples were collected at fixed intervals for 6 hr. High-quality images were obtained up to 48 hr after injection. The results show that the kinetics and excretion of Ru-97 DTPA are similar to those in In-111 DTPA. Radiation dose for identical activities is twice as high for In-111, in part because of greater abundance of the low-energy electron emission of In-111.

16169 **Method of freezing living cells and tissues with improved subsequent survival.** Senkan, S.M.; Hirsch, G.P. (to Department of Energy). US Patent 4,199,022. 22 Apr 1980. Filed date 8 Dec 1978. 6p.

This invention relates to an improved method for freezing red blood cells, other living cells, or tissues with improved subsequent survival, wherein constant-volume freezing is utilized that results in significantly improved survival compared with constant-pressure freezing; optimization is attainable through the use of different vessel geometries, cooling baths and warming baths, and sample concentrations.

16170 **Calculated characteristic x-ray reabsorption in radiographic screens.** Vyborny, C.J.; Metz, C.E.; Doi, K.; Haus, A.G. (Univ. of Chicago, IL). Contract EY-76-C-02-0069. *Journal of Applied Photographic Engineering ;* **4**: No. 4, 172-177(Fal 1978).

An important feature of x-ray absorption in radiographic screens is the production of characteristic radiation from the high Z elements in the screen phosphor. These characteristic x rays, which may be produced when the energy of the incident x rays is above the phosphor K edge, find the radiographic screens relatively transparent. Many escape the screens entirely taking wih them a fraction of the energy carried by the incident x ray. Characteristic x-ray escape and reabsorption are studied here for a number of typical radiographic screen pairs. It is shown that these processes have a significant effect on total screen energy absorption and that they may decrease the image sharpness produced by screen-film systems.

5507 Microbiology

REFER ALSO TO CITATION(S) 16134, 16135, 16136, 16139, 16142, 16163

16171 **Cryobiological method for the enrichment of fungal mutants.** Leef, J.L.; Gaertner, F.H. (Univ. of Tennessee, Oak Ridge). Contract W-7405-ENG-26. *Journal of General Microbiology, The ;* **110**: 221-224(1979).

In a previous abstract we reported the successful application of cryobiological techniques to the recovery of auxotrophic mutants of Neurospora crassa from a mixture of wild-type and mutant conidia. This communication presents in greater detail the methods used and the pertinent physiological observations which led to the development of the technique. We also show that by using cryobiological techniques it is possible to enrich for auxotrophs by means of the effects of either dehydration or the formation of intracellular ice.

5508 Morphology

REFER ALSO TO CITATION(S) 16128

5509 Pathology

REFER ALSO TO CITATION(S) 16151, 16199

5510 Physiological Systems

REFER ALSO TO CITATION(S) 16140, 16165, 16168, 16169

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 15788, 16100, 16137

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 15370, 15403, 15912, 15918, 16044, 16094, 16095, 16096, 16098, 16099, 16109, 16165, 16205, 16211

16172 **(PNL—3700(Pt.1)) Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.** Drucker, H. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Feb 1981. Contract AC06-76RL01830. 290p. NTIS, PC A13/MF A01.

Separate abstracts were prepared for 31 sections in this progress report. The appendix which deals with dose-effect studies with inhaled plutonium in beagles is not represented by a separate abstract. (KRM)

16173 (PNL—3700(Pt.1), pp 25-28) **Factors influencing the cross-placental transfer and teratogenicity of metallic pollutants.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project is concerned with certain heavy metals, associated with energy production, for which there is direct or inferential evidence of deleterious effects on prenatal development. Studies are in progress to determine the potentially embryotoxic effects of vanadium in rats. Preliminary results indicate that parenteral administration at 14 days gestation caused maximal embryonic resorption,

but that injection at 9 days gestation produced no overt embryotoxicity. Tracer ^{48}V studies performed in rats at 8, 15, and 19 days gestation demonstrated that fetoplacental ^{48}V burdens were highest following exposure in late development.

16174 (PNL—3700(Pt.1), pp 66-80) **Inhaled plutonium oxide in dogs.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project is concerned with long-term experiments to determine the life-span dose-effect relationships of inhaled $^{239}PuO_2$ and $^{238}PuO_2$ in beagles. The data will be used to estimate the health effects of inhaled transuranics. The tissue distribution of plutonium, radiation effects in the lung and hematologic changes in plutonium-exposed beagles with lung tumors were evaluated.

16175 (PNL—3700(Pt.1), pp 81-87) **Inhaled plutonium nitrate in dogs.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

Beagle dogs were given a single inhalation exposure to $^{239}Pu(NO_3)_4$ for lifespan dose-effect studies. All five dogs at the highest dose level, and 1 of 20 dogs at the medium-high dose level, died from radiation pneumonitis 14 to 42 mo after exposure. A dog from the highest dose level also had small, multiple bronchioloalveolar carcinomas. In addition, three dogs were euthanized because of osteosarcoma, 42 to 55 mo after exposure. Lymphopenia, neutropenia and decreased numbers of circulating monocytes and eosinophils occurred at the two highest dose levels. Complete programs were developed for the interactive storage, retrieval, and evaluation of data.

16176 (PNL—3700(Pt.1), pp 88-106) **Inhaled transuranics in rodents.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The purpose of this project is to examine, in small animals, the fate and effects of inhaled transuranic compounds including plutonium dioxide, americium oxides, americium nitrates and curium oxides. This project should provide data for hazard evaluation and establishment of permissible exposure limits to man for inhaled transuranics, particularly with respect to the effects of radiation dose and dose distribution. Inhalation carcinogenesis was the primary effect evaluated.

16177 (PNL—3700(Pt.1), pp 107-111) **Cigarette smoke and plutonium.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The overall objective of this study is to determine whether cigarette smoking increases the probability of plutonium-induced lung cancer. Initial experiments, designed to characterize the effect of chronic cigarette smoke exposure on pulmonary clearance of plutonium aerosols, are described.

16178 (PNL—3700(Pt.1), pp 112-122) **Toxicology of plutonium-sodium.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

Scenarios for liquid-metal fast breeder reactor (LMFBR) accidents predict the loss of sodium coolant, with subsequent core melt-down and release of mixed sodium-fuel aerosols [$Na-(PuU)O_2$] into the environment. A continuous aerosol-generating system for animal exposures was devised in which laser-generated fuel aerosols were swept through sodium vapor to form sodium-fuel aerosols. Physicochemical characterization of these aerosols revealed that fuel aerosols were enriched in uranium and oxygen relative to the fuel. Chemical studies to explore mechanisms for the enhanced solubility of the fuel-sodium aerosols revealed that uranium was rapidly converted to a soluble uranyl carbonate complex-ion species in the presence of air and moisture. Inhalation studies in rats and dogs indicated that initial pulmonary deposition was greater for fuel aerosols, but that the rate of pulmonary clearance of sodium-fuel aerosols was higher. The appearance of larger fractions of the initial lung burden in blood, liver, and skeleton suggested an enhanced in vivo solubility of the mixed aerosols.

16179 (PNL—3700(Pt.1), pp 130-135) **Inhalation hazards to uranium miners.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project determines the specific biological effects of exposure to known levels of uranium mine air contaminants, using both large and small experimental animals to model human respiratory disease. This project identifies agents or combinations of agents (both chemical and radiological), and their exposure levels, that produce respiratory tract lesions, including respiratory epithelial carcinoma, pneumoconiosis, and emphysema.

16180 (PNL—3700(Pt.1), pp 136-139) **Toxicology of krypton-85.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The purpose of this project is to obtain biological data to supplement earlier evaluations of the hazards of ^{85}Kr exposure. Dose-effect studies in rats exposed chronically for their life span are included to identify tissues at risk and determine tumorigenic potency. Effects of chronic ^{85}Kr exposure in adult and newborn rats are summarized.

16181 (PNL—3700(Pt.1), pp 140-150) **Toxicity of thorium cycle nuclides.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The purpose of this project is to investigate the biological hazards associated with uranium-thorium breeder fuels and fuel recycle process solutions. Initial studies will emphasize the metabolism and long-term biological effects of inhaled ^{233}U-^{232}U nitrate and oxide fuel materials and ^{231}Pa, a major long-lived radioactive waste product. Lung tumors were the major treatment-related malignant lesions of rats exposed to ^{233}U-^{233}U nitrates and oxides by inhalation.

16182 (PNL—3700(Pt.1), pp 151-169) **Fetal and juvenile radiotoxicity.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

A number of studies conducted under this project have demonstrated that many of the biological parameters used to calculate permissible levels of exposure of adults to radioactive materials are inappropriate for the rapidly growing infant or child or for the pregnant female. These include age-related differences in radionuclide deposition, distribution, and retention and associated differences in microdosimetry, as well as the greater intrinsic radiosensitivity of the immature organism. These findings emphasize the need for more detailed information on the metabolism and toxicity of radionuclides in the prenatal and juvenile mammal. The continuing objective of this project is to obtain such information, which is needed to establish appropriate exposure limits for radionuclides of greatest potential hazard to these age groups.

16183 (PNL—3700(Pt.1), pp 170-175) **Modifying radionuclide effects.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The metabolism and effects of radionuclides may be influenced by a number of dietary, physiological, and environmental factors. Some factors are studied which have been identified as potentially important determinants of radionuclide behavior: the reproductive performance of female rats exposed to ^{239}Pu during pregnancy or lactation, and the relative contribution of cross-placental and milk transfer to offspring.

16184 (PNL—3700(Pt.1), pp 176-186) **Gut-related studies of radionuclide toxicity.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project is concerned with the behavior of radioactive materials of importance in the nuclear industry that may be ingested as a consequence of a reactor accident, of unavoidable occupational exposure, or after release to the environment and incorporation into the food chain. Current emphasis is directed toward evaluating hazards from ingested actinides as a function of animal age, animal species, animal nutritional state, diet or chemicophysical state of the radionuclide. It is also concerned with nuclides that may be inhaled and passed through the gastrointestinal tract after clearance from the lungs.

16185 (PNL—3700(Pt.1), pp 187-200) **Viral and radiation carcinogenesis.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The studies included under this project are concerned with basic biological and biochemical indices that may aid in the detection and understanding of the primary effects of radiation insult and the initiation of the observed malignancies. A primary objective is to determine the role of virus in radiation-induced malignancies and in the process to identify those changes which might serve to monitor the oncogenic process. This report includes in vitro studies of the cytotoxic and mutagenic potential of ^{244}Pu, cell-mediated immunity in beagles exposed to $^{238}PuO_2$ and characterization of a porcine radiation-induced viral DNA polymerase.

16186 (PNL—3700(Pt.1), pp 201-202) **Development of blood irradiators.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project is designed to improve the techniques of blood irradiation through the development of improved and portable blood irradiators. A portable blood irradiator, consisting of a vitreous carbon body and thulium-170 radiation source, was attached to dogs via a carotid-jugular shunt, and its effects on the immune system measured. The device has demonstrated both significant suppression of circulating lymphocytes and prolonged retention of skin allografts.

16187 (PNL—3700(Pt.2), pp 67-68) **Transuranic behavior in soils and plants.** Wildung, R.E.; Garland, T.R.; Cataldo, D.A.; Rogers, J.E.; McFadden, K.M.; Jenne, E.A.; Schreckhise, R.G. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The principal objective of this study is to gather information about soil, plant, and foliar interaction factors that influence the availability of transuranics to agricultural plants and animals. This paper discusses plant processes which influence transport across the plant root membrane and foliar surfaces, and the form and sites of deposition of transuranic elements in mature plants.

16188 (PNL—3700(Pt.2), pp 71-72) **Analogs for transuranic elements.** Weimer, W.C.; Laul, J.C.; Kutt, J.C. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

A combined theoretical and experimental approach is being used to estimate the long-term environmental and biogeochemical behaviors of selected transuranic elements. The objective of this research is to estimate the effect that long-term (hundreds of years) environmental weathering has on the behavior of the transuranic elements americium and curium. This is achieved by investigating the actual behavior of naturally occurring rare earth elements, especially neodymium, that serve as transuranic analogs. Determination of the analog element behavior provides data that can be used to estimate the ultimate availability to man of transuranic materials released into the environment.

16189 (PNL—3700(Pt.2), pp 73) **Long-term plant availability of actinides.** Schreckhise, R.G.; Cline, J.F. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Environmental releases of actinide elements raise issues about which data are very limited. Quantitative information is required to assess the long-term behavior of actinides and their potential hazards resulting from the transport through food chains leading to man. This study provides valuable information on the effects of weathering and aging on the uptake of actinides from soil by range and crop plants grown under realistic field conditions.

16190 (PNL—3700(Pt.2), pp 101-104) **Sublethal effects of tritium on aquatic systems. Ecological effects of lithium and beryllium on aquatic communities. Teratological effects of low-level magnetic fields.** Strand, J.A.; Poston, T.M.; Skalaski, J.R.; Emery, R.M.; Klopfer, D.C.; Abernethy, C.S. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Studies of the sublethal effects of tritium on the relatively radiosensitive immune process of the rainbow trout suggest that a higher RBE value than is now recognized by the International Commission on Radiological Protection (ICRP) may be required. Studies included an evaluation of potential toxicity of lithium on embryological life of rainbow trout and an assessment of fate and effects of lithium in artificial stream habitats. Levels of lithium necessary to cause an observed effect would have to be at least three orders of magnitude above observed background. Studies on teratogenic effects of low-level magnetic fields address the need to assess the potential harmful effects of magnetic fields on attendant personnel working in the transport and hot cell areas of fusion reactors.

16191 (PNL—3700(Pt.2), pp 129) **Environmental dose assessment: methodology review.** Mueller, M.A. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

A comprehensive review is being performed on radiation dose assessment methodologies used by DOE and its contractors to access public exposure to radiation from operations at DOE facilities.

16192 (PNL—3700(Pt.2), pp 131) **Environmental impact statement analysis: dose methodology.** Mueller, M.A.; Strenge, D.L.; Napier, B.A. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Standardized sections and methodologies are being developed for use in environmental impact statements (EIS) for activities to be conducted on the Hanford Reservation. Five areas for standardization have been identified: routine operations dose methodologies, accident dose methodology, Hanford Site description, health effects methodology, and socioeconomic environment for Hanford waste management activities.

16193 (PNL—3700(Pt.4), pp 53-70) **Radiation dosimetry and radiation biophysics.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

Radiation dosimetry and radiation biophysics are two closely integrated programs whose joint purpose is to explore the connections between the primary physical events produced by radiation and their biological consequences in cellular systems. The radiation dosimetry program includes the theoretical description of primary events and their connection with the observable biological effects. This program also is concerned with the design and measurement of physical parameters used in theory or to support biological experiments. The radiation biophysics program tests and uses the theoretical developments for experimental design, and provides information for further theoretical development through experiments on cellular systems.

16194 (PNL—3700(Pt.4), pp 71-76) **Microdosimetry of internal sources.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

The purpose of this study is to develop practical methods for calculating microdosimetric distributions of plutonium or other alpha-emitting elements that are deposited, especially as particulates, in soft tissue and lung tissue. This study will aid the correlation and extrapolation of radiation effects measured at different levels of exposure and in different species.

16195 (PNL—3700(Pt.4), pp 77-78) **Dosimetry of Internal Emitters.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

The Dosimetry of Internal Emitters Program endeavors to refine the correlation between radiation dose and observed biological effects. The program is presently engaged in the development of studies that will test the microdosimetry models developed under the Microdosimetry of Internal Sources Program. Studies presented in this paper include in vitro alpha particle microdosimetry, krypton 85 infinite cloud exposure and organ dose analysis of uranium 232.

16196 **(SAND—81-0431) Beneficial uses of nuclear waste program: sewage sludge irradiation project, FY 1981 project plan.** (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP00789. 89p. NTIS, PC A05/MF A01.

This document presents the management plan and cost for the Sewage Sludge Irradiation Project, management structure, technical approach, and work breakdown structure. This document is organized into six major sections. Section 1 summarizes the history of the project and indicates a potential future course of action. Overall project objectives are described in Section 2. Long-range project plans are discussed in Section 3. Management structure and responsibilities at each level are discussed in Section 4. FY 1981 work activities are discussed in Section 5. Finally, project reporting plans are discussed in Section 6.

16197 **Effects of pre- and postnatal exposure to tritiated water for five generations on postnatal brain development.** Zamenhof, S.; Van Marthens, E. (Univ. of California, Los Angeles). Contract EY-76-S-03-0034. *Radiation Research ;* **85**: No. 2, 292-301(Feb 1981).

The possible long-term effects of chronic radiation exposure have been studied. Rats were given tritiated drinking water (3 μCi/ml) before and during pregnancy and thereafter continuously through five generations. The brains were studied at 30 and 120 days postnatally. Significant decreases in weight and DNA and protein contents of specific parts of the brain were found, the most pronounced decreases being in the diencephalon. The decrease in protein content were more pronounced than the decreases in DNA content; the decreases were also more pronounced at 30 days than at 120 days, and more pronounced in the fith generation than in previous generations.

16198 **Effects of x rays and fission neutrons on an induced proliferative response in lung type 2 epithelial cells.** Meyer, K.R.; Ullrich, R.L. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Radiation Research ;* **85**: No. 2, 380-389(Feb 1981).

The recovery of the proliferative response induced by butylated hydroxytoluene (BHT) was evaluated in the type 2 epithelial cell population of BALB/c mouse lung after x-ray or fission neutron irradiation. Previous autoradiographic studies revealed that the proliferative changes in the lung 2 days after BHT administration were due primarily to type 2 alveolar cells. When given immediately before BHT, radiation caused a dose-dependent decrease in the BHT-induced proliferative response, measured by [^{14}C]thymidine incorporation into DNA and by labeling studies. When the time between irradiation and BHT injection was lengthened, the proliferative response gradually returned in a dose-dependent manner. Two types of recovery processes were investigated.

16199 **Radiosensitivity in ataxia-telangiectasia: a new explanation.** Painter, R.B.; Young, B.R. (Univ. of California, San Francisco). *Proceedings of the National Academy of Sciences of the United States of America ;* **77**: No. 12, 7315-7317(Dec 1980).

The cause of increased radiosensitivity in ataxia-telangiectasia (AT) cells may be a defect in their ability to respond to DNA damage rather than a defect in their ability to repair it. Doses of x-radiation that markedly inhibited the rate of DNA synthesis in normal human cells caused almost no inhibition in AT cells and thus less delay during which x-ray damage could be repaired. The radioresistance of DNA synthesis in AT cells was primarily due to a much smaller inhibition of replicon initiation than in normal cells; the AT cells were also more resistant to damage that inhibited chain elongation. AT cells have been reported to undergo less radiation-induced mitotic delay than normal cells, which may cause them to move from G_2 phase into mitosis before repair is complete and may result in the increased incidence of chromatid aberrations observed by others. Therefore, AT cells fail to go through those delays that allow normal cells to repair DNA damage before it can be expressed.

16200 **DNA N-glycosylases and uv repair.** Demple, B.; Linn, S. (Univ. of California, Berkeley). *Nature (London) ;* **287**: 203-205(18 Sep 1980).

Repair of some DNA photoproducts can be mediated by glycosylic bond hydrolysis. Thus, Escherichia coli endonuclease III releases 5,6-hydrated thymines as free bases, while T4 uv endonuclease releases one of two glycosylic bonds holding pyrimidine dimers in DNA. In contrast, uninfected E. coli apparently does not excise pyrimidine dimers via a DNA glycosylase.

16201 **Release of photosynthates from mesophyll cells in vitro and in vivo.** Kaiser, W.M.; Paul, J.S.; Bassham, J.A. (Lawrence Berkeley Lab., CA). *Zeitschrift fuer Pflanzenphysiologie ;* **94**: No. 5, 377-385(1979).

Isolated mesophyll cells from Papaver somniferum and mesophyll cells in intact leaves from both Papaver somniferum and Spinacia oleracea were compared for their ability to export ^{14}C-labelled photosynthates. It was found that under isotonic conditions isolated mesophyll cells release only 0.75% of the total fixed carbon during a 1 h light period. In a detached whole leaf at least 6% of the carbon fixed during a 1 h light period in a small illuminated leaf area was exported into the surrounding tissue which was kept in the dark. The main exported products were the free sugars sucrose, glucose and fructose. Exported photosynthates were found nearly exclusively in the veins located basipetally from the illuminated area. It is concluded that export of photosynthate from the mesophyll requires intact symplastic connections. Release of photosynthate through the plasmalemma of mesophyll cells is extremely low and appears to occur via unspecific diffusion.

16202 **Pituitary radiation: radiation physics and biology.** Tobias, C.A. (Lawrence Berkeley Lab., CA). pp 221-243 of Recent advances in the diagnosis and treatment of pituitary tumors. Linfoot, J.A. (ed.). New York, NY; Raven Press (1979).

This chapter is a review of the radiation physics and radiobiology of the irradiated pituitary gland with experimental studies in rats and dogs and dosimetric studies in man. The effects of accelerated ion beam-irradiation on the pituitary gland and pituitary hormones are discussed as well as the effects of hypothalmic and brain irradiation. The dosimetry system used in human pituitary irradiation is presented along with representative isodose curves and Bragg ionization curves for various heavy-ion beams. The potential for improved pituitary therapy with high-energy particle beams is discussed.

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 16124, 16173, 16177, 16179, 16190

16203 (PNL—3700(Pt.1), pp 1-14) **Inhalation hazard to coal miners.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

Acceleration in coal mining activities to satisfy present and future energy needs may be constrained by potentially severe health hazards. Coal workers' pneumoconiosis (CWP), a chronic debilitating disease associated with coal mine dust, is one known entity; additional inhalation hazards may occur with the proposed extensive use of diesel engines in coal mines. The objectives of this project are to evaluate the biological effects of specific mine air contaminants in with coal dust and/or diesel exhaust inhalation.

16204 (PNL—3700(Pt.1), pp 15) **Pollutant metals and malnutrition.** Ragan, H.A. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project was first funded in FY 1976 to study the effects of malnutrition on absorption and retention of energy-associated pollutant metals. For studies funded in this project, rats and mice were used as animal models to examine the influence of iron deficiency on the fate of ingested, injected, or inhaled pollutant metals. Some of the important findings from studies funded in this project were, in brief: (1) gastrointestinal absorption of lead, cadmium, mercury, nickel and zinc was significantly greater in iron-deficient rats than in littermate controls, whereas vanadium absorption was less in iron-deficient rats than in controls; and absorption of arsenic was equivalent in the two groups; (2) intestinal absorption of plutonium in mice was significantly greater in the iron-deficient group, whereas absorption of plutonium in rats was the same as in the control group; (3) the transplacental movement of lead and cadmium was not increased in pregnant, iron-deficient rats compared to that in a similar group of control rats; (4) iron-deficient and control rats injected intramuscularly with the carcinogenic metal, nickel (Ni), had a similar incidence of tumors at the injection site.

16205 (PNL—3700(Pt.1), pp 16-24) **Alveolar clearance of inhaled metal oxides.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

Metal oxides produced during the combustion of fossil fuels constitute a potential hazard to man. The objectives of this project are to determine the fate of metals deposited in the lung, particularly as influenced by pulmonary cellular dynamics, and their acute and chronic toxicity. In particular, the carcinogenicity of cadmium oxides, vanadium oxides and selenium oxides in lung and extrapulmonary tissues that concentrate these metals after exposure are investigated.

16206 (PNL—3700(Pt.1), pp 124-129) **Toxicology of sodium and lithium.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project will obtain data for establishing emergency standards for sodium and lithium release accidents involving heat transfer systems such as those designed for use in LMFBRs or, in the case of lithium, magnetic fusion reactors. It will utilize an existing aerosol generation and exposure system in exposing young adult and adult rats to different concentrations of sodium and lithium combustion products. Three species of rodents, exposed to aerosols of sodium carbonate, exhibited respiratory distress. Lesions primarily involved the pharynx and larynx, and included accumulation of mucus, vesiculation, and edematous mucosa. Other lesions included edema and vesiculation of the anterior trachea, hemorrhage in the lungs and severe gastric tympany. Aerosols were monitored during inhalation exposure of animals by using an optical aerosol mass monitor. A model was developed to relate the various factors influencing chemical composition of aerosols in the exposure chamber.

16207 (PNL—3700(Pt.1), pp 217-221) **Health effects of synthetic fuels.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The purpose of this project is to investigate the potential human health hazards associated with synthetic fossil fuel technologies. Current studies are investigating the carcinogenic potential of epidermal exposure to materials and products from solvent-refined coal and shale oil technologies on a comparative basis with natural crude petroleum and known positive carcinogens. A mouse skin-painting assay system was used to determine the relative carcinogenicity of several crude fossil fuel materials and two known carcinogens.

16208 (PNL—3700(Pt.1), pp 223-225) **Toxicology of inhaled acid aerosols.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project is concerned with determining the long-term biological effects of exposure to inorganic acid aerosols, which are common to many industrial processes and to fossil fuel plant effluents. Rats were exposed to graded, subacutely toxic doses of HNO_3, HCl and H_2SO_4 to determine dose-related tumorigenesis.

16209 (PNL—3700(Pt.1), pp 235-242) **Toxic effects of geothermal effluents.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The purpose of this project is to investigate the potential for toxic effects of exposure to effluents from geothermal power plants. We are currently examining the potential toxic effects of exposure to hydrogen sulfide and/or ammonia, utilizing in vivo and in vitro biological systems. Studies summarized include those dealing with the effect of in vitro exposure to H_2S on rabbit alveolar macrophages, subacute toxicology of H_2S and ammonia in rodents and the effects of Mount St. Helens ash on macrophages.

16210 (PNL—3700(Pt.2), pp 87-88) **Effects of energy systems effluents on coastal ecosystems.** Roesijadi, G.; Young, J.S. Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

The objective of this research is to identify and evaluate effects that contaminants released by energy technologies have on the well-being of marine animals. The mechanisms that regulate subcellular trace metal binding and storage have been investigated, along with their relationship to the toxicity and detoxification of metals. Research results this past year included the following: (1) mussels exposed to mercury respond by induction of a low molecular weight, mercury-binding protein; (2) induction of the mercury-binding proteins is associated with an increased binding of mercury to the proteins; (3) previous exposure of mussels to low mercury concentrations results in an increased tolerance to toxic concentrations of mercury; and (4) characterizing the normal histology, histochemistry, and ultrastructure of the pinnules of the polychaete Eudistylia vancouveri.

16211 (PNL—3700(Pt.4), pp 9-23) **Modeling cellular effects of coal pollutants.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 4. Physical sciences.

The goal of this project is to develop and test models for the dose and dose-rate dependence of biological effects of coal pollutants on mammalian cells in tissue culture. Particular attention is given to the interaction of pollutants with the genetic material (deoxyribonucleic acid, or NDA) in the cell. Unlike radiation, which can interact directly with chromatin, chemical pollutants undergo numerous changes before the ultimate carcinogen becomes covalently bound to the DNA. Synthetic vesicles formed from a phospholipid bilayer are being used to investigate chemical transformations that may occur during the transport of pollutants across cellular membranes. The initial damage to DNA is rapidly modified by enzymatic repair systems in most living organisms. A model has been developed for predicting the effects of excision repair on the survival of human cells exposed to chemical carcinogens. In addition to the excision system, normal human cells also have tolerance mechanisms that permit continued growth and division of cells without removal of the damage. We are investigating the biological effect of damage passed to daughter cells by these tolerance mechanisms.

16212 Reproducibility of a life-cycle toxicity test with Daphnia magna. Parkhurst, B.R.; Forte, J.L.; Wright, G.P. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Bulletin of Environmental Contamination and Toxicology ;* **26**: No. 1, 1-8(Jan 1981).

Standardized chronic life-cycle toxicity testing procedures for aquatic species are described. The reproducibility of chronic toxicity and points using the static-renewal method with Daphnia magna are investigated. The objectives were to determine if the lowest rejected concentrations tested (LRCTs) obtained for six different toxicity criteria in static-renewal tests with acridine were reproducible over time and to determine the relative sensitivity and variability of the toxicity criteria. Two of the six toxicity criteria, numbers of young per brood and the young produced per female, were found to be reliable and sensitive for estimating the LRCT for acridine to D. magna. (RJC)

16213 Reevaluation of the toxicity of coal conversion process waters. Parkhurst, B.R. (Oak Ridge National Lab., TN); Meyer, J.S.; DeGraeve, G.M.; Bergman, H.L. *Bulletin of Environmental Contamination and Toxicology ;* **26**: No. 1, 9-15(Jan 1981).

The purposes of this paper are: (1) to clarify the role of ammonia in the toxicity of complex coal conversion wastewaters; (2) to reevaluate the toxic contribution of ammonia in the hydrocarbonization effluent; and (3) to compare these results with literature reports for other coal conversion effluents. In all of the coal conversion effluents discussed, phenol and un-ionized ammonia were the dominant toxic components. Although the relative abundance of these compounds varied among the process waters, their toxicity to Daphnia and the fish tested was additive. The LC_{50} dilutions of these process waters can be predicted from the individual LC_{50} concentrations of the major toxic components, their concentrations, and from the pH and buffering capacities of the dilution waters. (RJC)

16214 Bioaccumulation of chlorobiphenyls and endrin from food by lobsters (Homarus americanus). McLeese, D.W.; Metcalfe, C.D.; Pezzack, D.S. (Dept. of Fisheries and Oceans, St. Andrews, New Brumswick). *Bulletin of Environmental Contamination and Toxicology ;* **25**: No. 2, 161-168(Aug 1980).

The objectives of this paper are to determine the rates of dietary accumulation and clearance of two chlorobiphenyls and endrin in lobsters (Homarus americanus) fed contaminated mussels (Mytilus edulis). The chlorobiphenyls, representing intermediate and high degrees of chlorination, were chosen as model compounds to simulate the accumulation of PCB's. Endrin has been used extensively in eastern Canada and therefore it is of interest to determine its potential for accumulation within the trophic chain.

16215 Metal concentrations in tissues of dogs living in an airport area. Hayashi, M. (Hyogo Coll. of Medicine, Japan). *Bulletin of Environmental Contamination and Toxicology ;* **25**: No. 2, 246-251(Aug 1980).

With the progress of aircrafts as a means of transportation and with the appearance of jumbo jet planes for an increase in trasportation capacity, a variety of problems have come to the fore. Among others, when the fuel of the jet engine is burned, various metals contained in it are dispersed into the air. This constitutes one of the major factors for atmospheric contamination, in addition to the exhaust gas of automobiles, attracting attention as one of the public hazards in conjunction with the noise. The state of atmospheric contamination by the exhaust fume of aircrafts has already been reported. There has not been, however, a paper published on the influence of environmental pollution on organisms. The author has studied the distribution of lead and cadmium in the body of house-dogs which lived in essentially the same condition as human beings to obtain an index of the degree of invasion of environmental pollutants into the human body. The results obtained indicated that the distribution of these elements in dogs was applicable as a biological index of contamination of human beings. Thus, the present study was conducted to compare the concentrations of metals in the body of pet dogs living in an airport area and those kept in a non-airport area.

16216 Effects of acid precipitation on Daphnia magna. Parent, S.; Cheetham, R.D. (Worcester Polytechnic Inst., MA). *Bulletin of Environmental Contamination and Toxicology ;* **25**: No. 2, 298-304(Aug 1980).

Pollutants derived from fossil fuel combustion and precipitated from the atmosphere have substantially increased in the past decades. These materials, precipitated in such industrialized areas as southeastern Canada, have caused considerable alterations in aquatic ecosystems. Precipitation over most of the eastern United States is presently 10 to 500 times more acidic than is natural. Most affected aquatic ecosystems contain oligotrophic waters in regions of thin poorly buffered soils. Zooplankton are an important link in food chains of aquatic ecosystems and their disappearance or decline could drastically affect trophic relationships. Declines in zooplankton density in response to acid precipitation have been reported and short term survival of Daphnia pulex between pH 4.3 and 10.4; however, its potential for reproduction was limited to a fairly narrow range. Anderson (1944) noted the advantages of using daphnia as test organisms, and concluded that Daphnia magna was representative of other abundant zooplankton in sensitivity to toxic substances.

16217 Inactivation of SV40 replication by derivatives of benzo[a]pyrene. Chang, G.T.; Harvey, R.G.; Hsu, W.T.; Weiss, S.B. (Univ. of Chicago, IL). *Biochemical and Biophysical Research Communications ;* **88**: No. 2, 688-695(28 May 1979).

When African green monkey kidney cell lines, infected with simian virus 40, were exposed to benzo[a]pyrene-7,8-dihydrodiol or anti-benzo[a]pyrene-7,8-dihydrodiol-9,10-epoxide, inhibition of progeny virus formation was observed. Studies on [^{3}H]thymidine incorporation indicate that SV40 DNA synthesis is markedly impaired for the first 12 hours following BPDE treatment; 24 to 36 hours later, however, SV40 DNA synthesis is almost normal. These data suggest that the inhibition of SV40 DNA synthesis by BP derivatives is reversible and that the observed reduction in viral titer requires some other explanation.

16218 Cytocidal effect of rifamycin derivatives on ascites tumor cells: studies with [^{125}I] iododeoxyuridine. Hughes, A.M.; Calvin, M. (Lawrence Berkeley Lab., CA). *Cancer Letters (Amsterdam) ;* **6**: 15-19(1979).

The cytotoxicity of 2 rifamycin derivatives, rifazone-8_2 and rifampicin, on mouse ascites cells was studied, using the [^{125}I]iododeoxyuridine (IUDR) method of labeling the tumor cells. This technique allows a distinction to be made between a cytocidal and cytostatic effect. The 2 drugs exerted a cytocidal effect against 2 non-leukemic cell lines, but had no effect against 3 leukemic lines.

16219 Cadmium-resistant variant of the Chinese hamster (CHO) cell with increased metallothionein induction capacity. Hildebrand, C.E.; Tobey, R.A.; Campbell, E.W.; Enger, M.D. (Los Alamos Scientific Lab., NM). *Experimental Cell Research ;* **124**: 237-246(1979).

The toxic trace metal Cd^{2+} has been used to select a variant (designated Cd/sup r/) of the Chinese hamster cell (line CHO) resistant to the growth-inhibitory and cytotoxic effects of Cd^{2+}. Comparison of the relative capacities of these two cell types to induce specific low molecular weight Cd^{2+}-binding proteins (metallothioneins) reveals that the Cd/sup r/ cell has an increased capacity to induce metallothionein and to sequester intracellular Cd^{2+} in metallothioneins. These results suggest that the greater competence of the Cd/sup r/ cell to induce metallothionein is a major factor in the Cd^{2+}-resistant phenotype of the variant.

16220 Cadmium inhibition of vitamin D-mediated responses in organ-cultured embryonic chick duodenum. Corradino, R.A. (Cornell Univ., Ithaca, NY). Contract E(11-1)-2792. *Toxicology and Applied Pharmacology ;* **48**: 257-261(1979).

When added to the medium, cadmium inhibits 1α,25-dihydroxycholecalciferol-mediated responses in the organ-cultured embryonic chick duodenum: decreases induction of a specific calcium-binding protein (CaBP), prevents the elevation of alkaline phosphatase activity, and reduces the ability of the tissue to absorb radiocalcium at the mucosal surface. The cadmium effect is clearly

not generalized cytotoxicity. These results may be taken as evidence that cadmium can interfere with vitamin D action at the level of the target organ itself and is not necessarily secondary to alteration in vitamin D metabolism.

5604 Other Environmental Pollutant Effects

REFER ALSO TO CITATION(S) 16122

16221 (PNL—3700(Pt.1), pp 35-39) **Mutagenic effects of electric fields.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

Microbial and Drosophila test systems are being used to determine if large ac or dc electric fields may induce mutations. These organisms were chosen to enable exposure of large numbers with relatively simple apparatus, to minimize the time required for replications and dose-effect studies, and to offer the opportunity for investigating mechanisms, should effects be observed. A new system for exposing cell cultures to electric fields has been developed. This system uses agar bridges, having ionic constituents identical with those in the culture medium, interposed between the cell culture and the electrodes. Preliminary tests show that electrode effects are eliminated by use of the agar bridge.

16222 (PNL—3700(Pt.1), pp 40-44) **ac E-field dosimetry.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

Living organisms may be exposed to extremely low-frequency (ELF; frequency range, 0-100 Hz) electric fields produced by electric power systems or specialized communications systems. The actual electric fields to which an organism is exposed are different from the unperturbed field because of perturbations caused by the conducting body of the organism. Knowledge of these fields is crucial if data obtained in projects using animals are to be used for the assessment of possible hazards to humans exposed to ELF electric fields. The purpose of this project is to determine the actual fields experienced by electrically grounded and ungrounded human and animal models.

16223 (PNL—3700(Pt.1), pp 45-48) **In vivo mutagenesis-electric fields.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

These studies are concerned with the mutagenic potential of ac electric fields such as those which might be associated with the transmission of electric power. The project will provide indications of mutagenicity or primary DNA damage by electric field exposure in adult male, female and fetal rats and mice. Electric-field-induced sensitization to mutagens will be evaluated by measuring the subsequent susceptibility of selected cell populations from exposed animals to chemical mutagens.

16224 (PNL—3700(Pt.1), pp 49-53) **In vitro effects of electric fields.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

This project seeks to determine and quantify cytotoxicity, DNA damage and/or specific gene mutation resulting from exposure of mammalian cells in suspension to 60-Hz electric fields. Finally, if electric-field effects are detected, we will attempt to establish dose-response relationships.

16225 (PNL—3700(Pt.1), pp 205-214) **Biological effects of magnetic fields.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 1. Biomedical sciences.

The development of magnetic fusion power sources, as well as other technologies such as superconducting magnetic energy storage, magnetohydrodynamic power generation and magnetically levitated vehicles, increases the probability of exposure of people to magnetic fields. Reported here are studies using cultured mammalian cells, trout eggs, and stable, organic free radicals exposed to magnetic fields.

16226 (PNL—3700(Pt.2), pp 137) **Electric field and microwave research: biological studies of a 1200-kV prototype transmission system located near Lyons, Oregon.** Feb 1981.

In Pacific Northwest Laboratory annual report for 1980 to the DOE Assistant Secretary for Environment. Part 2. Ecological sciences.

Meeting future power demands requires innovative approaches to generation and transport of electrical power. Two such approaches were studied under DOE sponsorship. One approach is to place solar collector satellites in outer space and transmit electrical power to earth via microwave beams. The second approach involves transmission of power between regional power generation centers and population centers via ultrahigh-voltage transmission systems. While both approaches are technically feasible, questions about their environmental acceptability arise. In both cases, substantial land areas either along transmission line rights-of-way or near microwave receiving stations would be exposed to electromagnetic energy fields higher than background levels.

16227 **(UR—3490-1982) Pressure mediated reduction of ultrasonically-induced cell lysis.** Ciaravino, V.; Miller, M.W.; Carstensen, E.L. (Rochester Univ., NY (USA)). 1981. 16p. NTIS, PC A02/MF A01.

Chinese hamster V-79 cells, exposed in polystyrene tubes for 5 min to 1 MHz continous wave ultrasound, were lysed more by a $10W/cm^2$ than a $5W/cm^2$ intensity. Higher atmospheric pressure was needed to eliminate lysis with the former relative to the latter intensity, but lysis by $10W/cm^2$ was completely eliminated with 2 atmospheres of hydrostatic pressure. The reduction in lysis per unit increase in atomspheric pressure was comparable for both ultrasound intensities.

16228 **Temperature and cell survival variability across 9L subcutaneous tumors heated with microwaves.** Wallen, C.A.; Michaelson, S.M.; Wheeler, K.T. (Univ. of Rochester, NY). Contract AC02-76EV03490. *Radiation Research ;* **85**: No. 2, 281-291(Feb 1981).

The temperature gradients within a tumor during heat treatment could have profound biological effects. The temperatures obtained at five positions within rat 9L subcutaneous (sc) tumors during 2450-MHz microwave-induced heat treatment were monitored. The readings in the large tumors (0.80 to 1.50 g) were relatively uniform and were often slightly less than the temperature at the controlling thermocouple. The small tumors (0.15 to 0.50 g) also had uniform temperature profiles with the exception that the temperatures measured by the center thermocouple were generally higher. The variability in tumor cell survival was measured in 12 or 16 samples excised from heated or unheated tumors. The range of the resulting relative colony-forming efficiencies (RCFE) varied by factors > 100 in the heated tumors and was greatest in the small tumors. The large variability in the RCFEs of heated tumors can only partially be explained by the temperature differentials measured at the various locations within the tumor. This suggests that cells at various positions within these morphologically homogeneous 9L sc tumors have different sensitivities to the same temperature.

57 HEALTH AND SAFETY

16229 **(DOE/ET/13650—12) Analysis and comparison of five contractor safety and health manuals (EG & G, SR II, ORNL, Ashland, and MLGW).** Crowder, C.; Hurley, T. (Meyer (A.F.) and Associates, Inc., McLean, VA (USA)). Mar 1981. Contract AM01-80ET13650. 13p. NTIS, PC A02/MF A01.

An analysis is presented of five safety and health contractor manuals against the requirements of the FE OSH Manual (FE 5480.1), and a breakdown in chart form of how the manuals compare to each other is given. It is pointed out that the manuals are inadequate, but that site visits will be necessary to determine the

actual comprehensiveness of the faciilities' safety and health programs.

16230 **(HEDL-SA—2248) Process for controlling accidents in chemical laboratories.** Delvin, W.L. (Hanford Engineering Development Lab., Richland, WA (USA)). Oct 1980. Contract AC14-76FF02170. 21p. (CONF-810308—9). NTIS, PC A02/MF A01.

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

Most laboratory safety programs include inspections to identify hazards and thereby control accidents. There are certain elements that must be a part of a successful inspection and control process. These are a systematic and consistent inspection procedure, a reliable evaluation of identified hazards, and effective follow-up actions. Laboratory management, through its responsibility for the total system, has a key role in the inspection and control process for follow-up actions and accepting risks. If any of the above requirements are missing, the process will be less than adequate. Understanding the relationship between accidents, hazards, and risks is important in establishing an effective inspection and control program. Hazards are potential sources of accidents (accidents waiting to happen). Associated with each is a risk, which has two components: probability and consequence. Probability refers to the likelihood that a hazard will turn into an accident and consequence is the result of such an accident. In assessing the seriousness of a hazard, both probability and consequence must be considered in terms of risk level and acceptability. This paper presents a process that can be used by laboratory management to establish an effective inspection and control program for the laboratory. A discussion of safety concepts and their relationships that affect the process is included.

16231 **(LA—8712-MS) Penetration of >5-μ chrysotile asbestos fibers through DuPont Tyvek 1422A and Kimberly-Clark CPF fabrics.** Weeks, R.W. Jr.; McLeod, M.J. (Los Alamos Scientific Lab., NM (USA)). Jan 1981. Contract W-7405-ENG-36. 12p. NTIS, PC A02/MF A01.

Aerosols of 4.1-μ mass median aerodynamic diameter chrysotile asbestos fibers were generated and passed through stitched (seamed) and unstitched (unseamed) DuPont Tyvek 1422A and Kimberly-Clark composite polypropylene fabric (CPF) spunbonded fabrics. The two unstitched fabrics and the two stitched fabrics were penetrated by amounts of chrysotile which did not allow a statistically significant difference in penetration to be observed. Both the Tyvek and the CPF allowed approximately a 1% penetration through the unstitched material and approximately a 30% penetration through the stitched material. These values refer to the suit materials per se and not to the entire garment. As such, they should not be considered as representative of the entire suit as worn by Navy personnel.

16232 **Glove permeation by organic solvents.** Nelson, G.O.; Lum, B.Y.; Carlson, G.J.; Wong, C.M.; Johnson, J.S. (Univ. of California, Livermore). *American Industrial Hygiene Association Journal ;* **42**: No. 3, 217-225(Mar 1981).

The vapor penetration of 29 common laboratory solvents on 28 protective gloves has been tested and measured using gas-phase, infrared spectrophotometric techniques to determine the permeation characteristics. Five different types of permeation behavior were identified. No one glove offered complete protection against all the solvents tested. The permeation rate of the solvent was found to be inversely proportional to glove thickness for a given manufacturer's material. Of two solvent mixtures tested, one exhibited a large, positive, synergistic rate.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 15340, 15365

16233 **(USGS-OFR—81-31) Geology of Nash Draw, Eddy County, New Mexico.** Bachman, G.O. (Sandia National Labs., Albuquerque, NM (USA)). 1981. 47p. NTIS, PC A03/MF A01.

Nash Draw is a partially closed depression about 29 km (17 mi) east of Carlsbad, Eddy County, New Mexico. It has been mapped geologically in conjunction with detailed studies to evaluate the proposed nuclear Waste Isolation Pilot Plant (WIPP). The stratigraphic section exposed in Nash Draw includes the Rustler Formation and Dewey Lake Red Beds of Late Permian (Ochoan) age, the Dockum Group of Late Triassic age, and the Pleistocene Gatuna Formation. Other deposits of Middle to late Quaternary age include the Mescalero caliche, spring deposits, and windblown sand. Dissolution of evaporites has been a major process in the formation of Nash Draw. Nash Draw formed before, and during, Gatuna time about 600,000 years ago. Near-surface dissolution of gypsum in the Rustler Formation is presently active and is responsible for numerous collapse sinks and related karst features.

5802 Geophysics

REFER ALSO TO CITATION(S) 15252, 15432, 16055, 16106

16234 **(ORNL-tr—4699) Application of geophysical measurement techniques in the localization of brine and the determination of the structure and boundaries of salt deposits. Localization of brine in salt mines using high frequency.** (Oak Ridge National Lab., TN (USA)). [nd]. Translated from Kali und Steinsalz, 7: No. 8, 359-360(Oct 1978); and Geologisches Jahrbuch, 90: 283-314(1972). 34p. NTIS, PC A03/MF A01.

Included in this report are abstracts of papers concerning the use of acoustic and electromagnetic sensing techniques in the delimitation of brine inclusions in salt deposits and in the determination of the structure of salt deposits. The second part of the report is a paper, by Heinz Nickel, describing the use of electromagnetic absorption measurements to localize brine inclusions in salt deposits. (ACR)

16235 **Seismic gaps and plate tectonics: seismic potential for major boundaries.** McCann, W.R.; Nishenko, S.P.; Sykes, L.R.; Krause, J. (Columbia Univ., Palisades, NY). Contract EY-76-S-02-3134B. *Pure and Applied Geophysics ;* **117**: 1081-1147(1979).

The theory of plate tectonics provides a basic framework for evaluating the potential for future great earthquakes to occur along major plate boundaries. Along most of the transform and convergent plate boundaries considered in this paper, the majority of seismic slip occurs during large earthquakes, i.e., those of magnitude 7 or greater. The concepts that rupture zones, as delineated by aftershocks, tend to abut rather than overlap, and large events occur in regions with histories of both long-and short-term seismic quiescence are used in this paper to delineate major seismic gaps. The term seismic gap is taken to refer to any region along an active plate boundary that has not experienced a large thrust or strike-slip earthquake for more than 30 years. A region of high seismic potential is a seismic gap that, for historic or tectonic reasons, is considered likely to produce a large shock during the next few decades. The seismic gap technique provides estimates of the location, size of future events and origin time to within a few tens of years at best. The accompanying map summarizes six categories of seismic potential for major plate boundaries in and around the margins of the Pacific Ocean and the Caribbean, South Sandwich and Sunda (Indonesia) regions for the next few decades. These six categories are meant to be interpreted as forecasts of the location and size of future large shocks and should not be considered to be predictions in which a precise estimate of the time of occurrence is specified. The categories of potential assigned here provide a rationale for assigning priorities for instrumentation, for future studies aimed at predicting large earthquakes and for making estimates of tsunami potential.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 15372

16236 **(DOE/ER/10361—1) Mechanical and transport properties of rocks at high temperatures and pressures. Task I, the physical nature of fracturing at depth. Technical progress report No. 1, 1 March 1980-30 November 1980.** Carter, N.L. (Texas A and M Univ., College Station (USA). Center for Tectonophysics). 15 Dec 1980. Contract AS05-79ER10361. 31p. NTIS, PC A03/MF A01.

Research progress is reported in the following areas: (1) the delineation of the boundary separating elastic-brittle and transient-l semibrittle behavior of granite and of its volcanic and metamorphic equivalents, rhyolite and granite gneiss; (2) the variation of fracture permeability in Sioux Quartzite, Westerly Granite and a fine-l grained gabbro as a function of effective pressure and hydrothermal alterations; and (3) determine the mechanical properties of selected rocks at high temperatures and pressures. (ACR)

16237 **(DOE/ER/10445—T2) Experimental study of opening-mode crack growth in rock. Progress report and renewal proposal.** Gordon, R.B. (Yale Univ., New Haven, CT (USA). Dept. of Geology and Geophysics). Feb 1981. Contract AC02-79ER10445. 10p. NTIS, PC A02/MF A01.

Research progress is reported on studies relating the fracture toughness of rock to its microstructure with a view to establishing the structural factors that control toughness and fracture characteristics. Additionally, a detailed review is being made of published data on the fracture toughness of rocks. (ACR)

16238 **(UCRL—85624) Models for jointed rock structures.** Heuze, F.E.; Barbour, T.G. (Lawrence Livermore National Lab., CA (USA); Science Applications, Inc., Steamboat Springs, CO (USA)). Mar 1981. Contract W-7405-ENG-48. 16p. (CONF-810517—1). NTIS, PC A02/MF A01.

From International conference on computing in civil engineering; New York, NY, USA (11 May 1981).

This paper presents two new developments and refinements in the modeling of rock structures: a new model for axisymmetric interfaces such as found in shaft and footing designs, for example, and a new model for the dilatant effects of rock joints, such as encountered in underground caverns and reinforced rock slopes. The new models were incorporated into a finite element program, and test-case analyses were performed. The results indicate that the use of the new model can lead to safer estimates of footing settlements and shaft lining stresses, as well as to more economical design of rock reinforcement. We also note that, because the new dilatant joint provides a refined estimate of joint opening and closing, it can be applied as well to the analysis of hard rock hydraulics, in which the flow is very sensitive to fracture aperture.

5804 Geochemistry

REFER ALSO TO CITATION(S) 15339, 15341

64 PHYSICS RESEARCH

6401 Astrophysics And Cosmology

16239 **(BNL—29025) CP violation and the development of cosmological baryon asymmetry.** Senjanovic, G. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 32p. (CONF-801244—3). NTIS, PC A03/MF A01.

From Workshop on weak interactions as probes of unification; Blacksburg, VA, USA (3 Dec 1980).

A discussion of the origin of the observed matter-antimatter asymmetry of the universe is presented in the context of the standard cosmological model. Except in the case of the minimal SU(5) theory, it is possible that grand unified theories predict the right order of magnitude for the ratio of baryon to photon number. The question of CP violation is addressed in detail and it is shown that, tied up with symmetry nonrestoration at high temperature, the soft CP violation does remain at $T \cong 10^{15}$ GeV as to lead to the creation of baryon asymmetry in the very early universe.

6402 Atmospheric Physics

16240 **(AD-A—084101) Automatic ionospheric parameter extraction from digital ionogram data. Interim report.** Smith, S.; Reinisch, B.W.; Tang, J.S.; Bibl, K. (Lowell Univ., MA (USA). Research Foundation). Nov 1979. Contract F19628-78-C-0085. 67p. NTIS, PC A04/MF A01.

The development of techniques to automatically extract the ionospheric ionization parameters of foF2, M(3000), fmin, and ftEs from digital ionograms have become feasible with the advent of advanced digital sounders. From digital ionogram data of the Digisonde 128PS the six most significant echoes for each frequency are extracted in the Geomonitor. They are further processed in the Automatic Parameter Evaluation program (A.P.E.) to determine the main echo height for each frequency. The program takes into consideration the frequency continuity of the reflection height, multiple hop reflection heights, rate of change of slope and the physical properties of the ionogram such as foE's dependence on the solar zenith angle. The output data are mathematically smoothed to produce a refined ionogram. From this refined ionogram the A.P.E. program determines the four ionospheric parameters. In a study of 1500 ionograms the automatically evaluated ionogram parameters are compared with the manually scaled values and the differences are analyzed statistically. Also some case studies are discussed concentrating on the reasons for larger deviations. The program has been written considering the future possibility of implementation in a microcomputer which can integrate the functions of the Geomonitor, as well as a True Height Analysis program.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 15869, 15870, 16271, 16291

16241 **(ANL-HEP-PR—80-30) Inelastic thresholds and dibaryon resonances.** Edwards, B.J.; Thomas, G.H. (Argonne National Lab., IL (USA)). Jun 1980. Contract W-31-109-ENG-38. 45p. (CONF-800724—71). NTIS, PC A03/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

A method of Basdevant and Berger is applied to the problem of whether there are pp resonances near the $n\Delta^{++}$ threshold. In particular, the $^1D_2$ partial wave of proton-proton elastic scattering is analyzed around this threshold. The method is expected to determine (in principle) whether the pp partial waves in which structure has been observed are resonant and, in this event, allow a reliable determination of the resonance parameters.

16242 **Microscopic wave functions for 0^+ states in the ^{4}He system.** Bevelacqua, J.J. (Department of Energy, Oak Ridge, TN (USA). Oak Ridge Operations Office). *Canadian Journal of Physics ;* **57**: No. 9, 1478-1483(Sep 1979).

Ground and first excited state admixtures in the ^{4}He system are investigated. The results are consistent with other calculations and predict $^1S_0$, $^3P_0$, and $^5D_0$ admixtures of 96.08, 0.03, and 3.89% for the ground state. The first excited state has similar admixtures, but the P-wave strength is about five times larger than the corresponding ground state admixture. The enhancement factor kappa in the electric dipole sum rule is also calculated, but is much larger than the experimental value. The calculated value of kappa varies by approximately 10% if a ^{4}He binding energy constraint is imposed.

16243 **(IS-T—922) Raman scattering by a molecule adsorbed at the surface of a thin metallic film.** Wright, M.F. (Ames Lab., IA (USA)). 1980. 85p. NTIS, PC A05/MF A01.

Thesis submitted to Iowa State Univ.

The Raman scattering cross section is calculated using standard third order perturbation theory. The scattering is viewed as a

three-stage process: an electron-hole pair is created in the metal by the incident photon; the excited electron scatters off the molecule inelastically, exciting a molecular vibration; the electron finally recombines with the hole emitting the Raman scattering photon. This is one of the mechanisms proposed by Burstein and co-workers. The electrons in the film are confined by infinite potential barriers at the surfaces, but are otherwise free. The resulting sinusoidal one-electron eigenfunctions are used to calculate the nonlocal conductivity tensor in the random phase approximation. Maxwell's equations are then used to determine the vector potential inside the film, which allows the electron-photon matrix elements to be calculated. The electron-molecule interaction is deduced from experimental data on low energy inelastic electron scattering from polar molecules. Calculations are performed for the frequency dependence of the Raman cross section with two different film thicknesses.

16244 (IS-T—936) New techniques in atomic and molecular laser spectroscopy. Steenhoek, L.E. (Ames Lab., IA (USA)). Feb 1981. 170p. NTIS, PC A08/MF A01.

Over the last two decades, there has been tremendous development in the field of laser technology leading to major advances in the fields of atomic and molecular spectroscopy. This is evidenced by the large number of books and review papers that have been written to document this development. The laser as a light source has been a boom to the spectroscopist for at least three different reasons. The first of these is the increase in resolution attainable in conventional spectroscopy. The laser presents itself as a more powerful source of monochromatic light than conventional light sources and monochromators. The second reason that the laser has shown itself to be such a powerful spectroscopic tool is that laser light can be generated in extremely short pulses which enables one to study very rapid transient states. Finally, the laser has facilitated the development of a series of spectroscopic methods which include transition schemes that can be probed because of the high power that the laser presents. The main goal of the research presented in this dissertation is the development of new laser-based spectroscopic techniques which utilize some of these valuable properties. This dissertation is divided into two parts which reflect the two basic areas of the research. Part I describes the development of a number of new nonlinear spectroscopic techniques. The techniques described include examples of two- and three-photon absorption as well as inverse Raman spectroscopy.Part II is devoted to a study of spatial mapping of spectral sources. This work couples the use of a laser with digital-image processing technology. Described are examples which include the mapping of atomic and molecular species in flames as well as atomic species in laser-generated vapor plumes.

16245 (UCID—18932) Extended rate equations. Shore, B.W. (Lawrence Berkeley Lab., CA (USA); Centre Europeen de Calcul Atomique et Moleculaire, Orsay (France)). 30 Jan 1981. 41p. NTIS, PC A03/MF A01.

The equations of motion are discussed which describe time dependent population flows in an N-level system, reviewing the relationship between incoherent (rate) equations, coherent (Schrodinger) equations, and more general partially coherent (Bloch) equations. Approximations are discussed which replace the elaborate Bloch equations by simpler rate equations whose coefficients incorporate long-time consequences of coherence.

16246 Line-of-sight deposition method. Patten, J.W.; McClanahan, E.D.; Bayne, M.A. (to Dept. of Energy). US Patent Application 140,948. 16 Apr 1980. 17p.

A line-of-sight method of depositing a film having substantially 100% of theoretical density on a substrate. A pressure vessel contains a target source having a surface thereof capable of emitting particles therefrom and a substrate with the source surface and the substrate surface positioned such that the source surface is substantially parallel to the direction of the particles impinging upon the substrate surface, the distance between the most remote portion of the substrate surface receiving the particles and the source surface emitting the particles in a direction parallel to the substrate surface being relatively small. The pressure in the vessel is maintained less than about 5 microns to prevent scattering and permit line-of-sight deposition. By this method the angles of incidence of the particles impinging upon the substrate surface are in the range of from about 45° to 90° even when the target surface area is greatly expanded to increase the deposition rate.

16247 Optical observations of molecular dissociation in thin foils. Gay, T.J.; Berry, H.G. (Argonne National Lab., IL (USA)). *Journal of Physics, B (London). Atomic and Molecular Physics (Formerly Journal of Physics, B (London). Proceedings of the Physical Society (Atomic and Molecular Physics))* ; **13**: No. 6, L199-L204(28 Mar 1980).

Measurements are presented of the intensity and polarisation of light emitted from two excited states of neutral helium, after break-up of the HeH^+ molecule in thin foils. The foil thickness was varied to study their dependence on the internuclear separation of the He and proton at the final foil surface and it is postulated that the variations observed are sensitive to the molecular orbitals of the dissociating HeH^+ molecule. These vicinage effects provide the distance scale of the final state interaction at the foil surface.

16248 Fourier transform of two-centre charge distribution. Junker, B.R. (Oak Ridge National Lab., TN (USA)). *Journal of Physics, B (London). Atomic and Molecular Physics (Formerly Journal of Physics, B (London). Proceedings of the Physical Society (Atomic and Molecular Physics))* ; **13**: No. 6, 1049-1056(28 Mar 1980).

At medium and high collision energies travelling orbitals, i.e. orbitals with translational factors, must be employed in charge-transfer calculations. This results in two-centre matrix elements of the form of a Fourier transform. Similar Fourier transform matrix elements arise in the Bethe theory of the scattering of a structureless charged particle by a diatomic molecule as well as in the computation of the coherent and incoherent intensity for x-rays scattered by molecules. Although a number of strategies have been adopted for the evaluation of these integrals, no simple general expression exists for Slater-type orbitals (STO). In this paper, such a general expression is derived which contains only small sums and a single numerical integral over an integrand which contains a spherical Bessel function.

16249 Absorption of H and D Ly-α radiation by O_2 molecules at high temperatures. Chiang, C.C.; Skinner, G.B. (Wright State Univ., Dayton, OH). Contract EY-76-S-02-2944. *Journal of Quantitative Spectroscopy and Radiative Transfer* ; **24**: 525-528(1980).

Absorption cross sections of molecular oxygen were measured at the H and D Ly-α wavelengths (1215,67 and 1215,34 A) between 800 and 1700°K, the cross sections being given by the equation σ (cm^2) = 4.2E-18 exp (-3070/T)(4.2E-18 = 4.2 x 10^{-18}). The absorption cross section for $\nu = 1$ is (9+-2)E-19 cm^2 and that for $\nu = 2$ is (7+-3)E-18 cm^2, compared to 1.E-20 cm^2 for $\nu = 0$. Vibrational relaxation times were found to be in agreement with literature data over the range of common temperatures. 2 figures, 1 table.

16250 Photoelectron angular distributions of HBr and HI at hν = 21.2 eV. White, M.G.; Southworth, S.H.; Kobrin, P.; Shirley, D.A. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *Journal of Electron Spectroscopy and Related Phenomena* ; **19**: 115-122(1980).

Photoelectron angular distributions for the $^2\pi$/sub 3/2,1/2/ $(p)^{-1}$ and ^{2}SIGMA/sub 1/2/$^+$ $(p\ \sigma)^{-1}$ ionic states of HBr and HI have been measured at a photon energy of 21.2 eV. The asymmetry parameters for the highly localized $p\pi$ orbitals closely follow those of the lone-pair orbitals of the related CH_3X molecules and the outer np atomic orbitals of the corresponding united atoms. Furthermore, the asymmetry parameters for the $^2\pi$/sub 3/2/ and $^2\pi$/sub 1/2/ states were found to be equal within experimental uncertainty, despite the large spin-orbit splittings of these heavy molecules. The asymmetry parameters for the $^2\Sigma^+(p\ \sigma)^{-1}$ ionic states are significantly smaller than for the $^2\pi(p\pi)^{-1}$ states, in contrast to recent predictions based on angular momentum transfer theory. 1 figures, 2 tables.

16251 **Semiclassical studies of bound states and molecular dynamics.** Marcus, R.A.; Noid, D.W.; Koszykowski, M.L. (Univ. of Illinois, Urbana). pp 283-292 of Stochastic behavior in classical and quantum hamiltonian systems. Casati, G.; Ford, J. (eds.). Berlin, Germany; Springer-Verlag (1979).

From International conference on stochastic behavior and quantum hamiltonian systems; Como, Italy (20 Jun 1977).

Semiclassical studies on molecular bound states, molecular collisions, and time-dependent dynamical systems are described. Several methods have been evolved for determining the action variables of nonseparable bound-state systems, and thereby for calculating their quantum-mechanical eigenvalues. Nonresonant and resonant systems are included, and surfaces of section in higher (>2) dimensional as well as in two-dimensional systems are obtained. Further, from the Fourier transform of an autocorrelation function the molecular spectrum can be determined directly from a trajectory. The effect of an oscillating electric field on a molecule is discussed semiclassically with a view to obtaining a relation between the classical mechanical and quantum mechanical treatments. 8 figures, 1 table.

6404 Fluid Physics

16252 **(AD-A—088148) Feasibility study of applying laminar flow control to an lta vehicle. Final report.** Warner, D.J.; Ozgur, S.A.; Haigh, W.W. (Dynamics Technology, Inc., Torrance, CA (USA)). Apr 1980. Contract N00140-79-C-6565. 48p. NTIS, PC A03/MF A01.

The feasibility of applying laminar boundary-layer control with body shaping to a high altitude, Lighter-Than-Air vehicle was investigated. Solar-radiation-induced surface heating was shown to have a destablizing effect on laminar flow and caused the laminar flow to break down on regions of the vehicle surface exposed to high levels of solar radiation. Aerodynamic drag estimates were made for the vehicle. Surface waviness and roughness criteria for achieving laminar flow were determined.

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 16014

16253 **(ANL-HEP-CP—80-38) pp spin correlations at high p/sub T/.** Auer, I.P.; Colton, E.; Ditzler, W.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. (CONF-800724—72). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

New data are presented for measurements of the spin correlation in pp reactions with longitudinally polarized beam and target. Data were obtained at 11.75 GeV/c for both elastic scattering and for π^+- and π^--production at high p/sub T/ in pp reactions at 11.75 GeV/c. A comparison is made with recent predictions of quark-parton models.

16254 **(ANL-HEP-CP—80-66) Summary of physics from measurements with longitudinally polarized beams and targets at ZGS energies.** Yokosawa, A. (Argonne National Lab., IL (USA)). Sep 1980. Contract W-31-109-ENG-38. 6p. (CONF-800994—12). NTIS, PC A02/MF A01.

From International symposium on H.E. physics with polarized beams and polarized targets; Lausanne, Switzerland (25 Sep 1980).

An extensive amount of data were obtained from measurements of proton-proton elastic scattering from 1 to 12 GeV/c using longitudinally polarized beams and targets. Physics learned from these data as well as other related experimental results is summarized. The topics include structures observed in nucleon-nucleon scattering at lower energies and dinucleon resonances, pp scattering-amplitude measurements at 6 GeV/c, and lerge p/sub perpendicular/ results in pp elastic scattering.

16255 **(COO—3244-80) Meson-nuclear interactions at medium energies.** Eisenstein, R.A. (Carnegie-Mellon Univ., Pittsburgh, PA (USA)). 1981. Contract AS02-76ER03244. 22p. (CONF-810115—6). NTIS, PC A02/MF A01.

From Nuclear and particle physics at energies up to 31 GeV: new and future aspects conference; Los Alamos, NM, USA (Jan 1981).

A brief review of selected directions in medium energy physics is given. Special attention is paid to the propagation of hadrons in the nuclear medium which results in a modification of the free properties of the probe hadron and the nucleus. Such modifications are germane to our understanding of both particles and nuclei. Examples are given involving pion and kaon scattering, absorption and production from nuclei. Some of what has been learned is summarized and some of the hopes for the future are outlined.

16256 **(DOE/ER/00946—T1) High-energy hadron-hadron collisions. Annual progress report.** Chou, T.T. (Georgia Univ., Athens (USA). Dept. of Physics). Feb 1981. Contract AS09-76ER00946. 13p. NTIS, PC A02/MF A01.

Work on high energy hadron-hadron collisions in the geometrical model is summarized. Specific items that were studied include the existence and movement of dips in elastic p anti p collisions, the angular distributions for elastic scattering and diffraction dissociation of hadrons on nuclei, and a model calculation of scattering parameters in high energy two-body collisions.

16257 **(SLAC—238) Study of natural spin-parity strange meson radial excitations in $K^-p \rightarrow K^-\pi^+n$ at 11 GeV/c.** Durkin, L.S. (Stanford Linear Accelerator Center, CA (USA)). Dec 1980. 285p. NTIS, PC A13/MF A01.

Results are presented from a high statistics study of the reaction $K^-p \rightarrow K^-\pi^+n$ at 11 GeV/c. This data was selected offline from an ~ 1000 event/μb K^-p experiment run on the Large Aperture Solenoid Spectrometer (LASS) at SLAC which triggered on essentially the total inelastic cross section. This $K^-\pi^+n$ sample, after cuts, contained ~ 42,000 events in the Kπ invariant mass region from 0.65 GeV to 2.30 GeV, and absolute value $t' < 0.2$ GeV^2. A spherical harmonic angular moments analysis of this data is presented, as well as an energy independent partial wave analysis (PWA) of these angular moments. The nearly uniform acceptance characteristics of this data allowed a detailed analysis, which yielded information on natural spin-parity strange meson resonances in the Kπ invariant mass range from 0.65 GeV to 2.30 GeV. The well established K*(895), K*(1430), and K*(1780) are observed, and clear evidence is presented for a J/sup P/ = 4^+ strange meson state at a mass of 2.08 GeV. The $K^-\pi^+$ elastic scattering partial waves extracted in this PWA show unambiguous evidence for a relatively narrow S wave resonance near 1.42 GeV in the Kπ invariant mass. This state is a confirmation of the 0^+ K(1500) seen in previous PWA's. A new higher S wave resonance is clearly seen unambiguously near 1.90 GeV. Unambiguous evidence is presented for a relatively wide P wave resonance in the 1.70 GeV region.A second new P wave resonance also is seen in two of four ambiguous partial wave solutions in the 2.10 GeV region. These resonance states are discussed within the framework of a simple harmonic oscillator quark model. In particular three of the underlying resonances are discussed as possible natural spin-parity strange meson radial excitations.

16258 **(SLAC-Trans—0196) Measurement of the pion form factor near the threshold of the reaction $\epsilon i\epsilon^- \rightarrow \pi^+\pi^-$ with a time-of-flight detector.** Vasserman, I.B.; Ivanov, P.M.; Kezerashvili, G.Ya.; Koop, I.A.; Lysenko, A.P.; Pestov, Yu.N.; Skrinskii, A.N.; Fedotovich, G.V.; Shatunov, Yu.M. Feb 1981. Translation of Preprint 80-169, August 1980. 27p. NTIS, PC A03/MF A01.

The pion form factor was measured in the range of energies $\sqrt{S}$ from 0.5 GeV to 0.46 GeV for colliding electron-positron beams. The particles produced were separated by species by means of a new time-of-flight method based on localized-discharge spark counters, with a record time resolution of $\sigma \approx 30$ psec. The values obtained for the form factor confirm the validity of predictions of the meson vector dominance model near the threshold of the reaction $\epsilon^+\epsilon^- \rightarrow \pi^+\pi^-$. An average value <eta/sub $\pi/^2$> = 0.366 +- 0.047 f^2 was obtained for the square of the pion electromagnetic radius.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 16282

16259 (ANL-HEP-CP—80-26) Search for narrow resonances in pp→pπ⁺n at 2 GeV/c. Sauer, J.R.; Wicklund, A.B.; Arenton, M.W. (Argonne National Lab., IL (USA); Rice Univ., Houston, TX (USA). Dept. of Physics; Elmhurst Coll., IL (USA). Dept. of Physics; Chicago Univ., IL (USA). Enrico Fermi Inst.). Jul 1980. Contract W-31-109-ENG-38. 8p. (CONF-800724—70). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

A preliminary analysis of an experiment designed as a sensitive dibaryon resonance search in the reaction pp→pπ⁺n is presented. At 2 GeV/c incident momentum, 440,000 unambiguously reconstructed events were obtained. In this preliminary analysis, the results are reported of a search of the pn mass spectrum for evidence of chain decays of possible dibaryon resonances, i.e. pp→d/sup **/, d/sup **/→d/sup **/π⁺, d/sup */→pn. No evidence of narrow peaks (≦ 7 MeV) is seen in the data for cross-section-times-branching-ratio greater than 50 μb.

16260 (ANL-HEP-CP—80-50) Exotic baryons. Yokosawa, A. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 19p. (CONF-800763—5). NTIS, PC A02/MF A01.

From Baryon 80 conference; Toronto, Canada (14 Jul 1980).

The present status of exotic baryons including the S = 0 and S = +- 1 system, and five-quark exotic levels is discussed.

16261 (ANL-HEP-CP—80-59) Higher twist QCD terms in high-p/sub T/ pion production. Berger, E.L.; Gottschalk, T.; Sivers, D. (Argonne National Lab., IL (USA)). Aug 1980. Contract W-31-109-ENG-38. 7p. (CONF-800724—74). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The higher twist subprocesses qG → qπ⁺⁻ and q anti q → Gπ⁺⁻ in the framework of perturbative Quantum Chromodynamics (QCD) are investigated. Cross sections for these processes are compared with the minimum twist QCD results for q anti q → q anti q and qG → qG. The higher twist terms give sizeable corrections to the inclusive pion yields, particularly for q anti q initial states. The effects of higher twist QCD terms for the charge ratio, $N(\pi^- N \to \pi^- X)/N(\pi^- N \to \pi^+ X)$ are examined.

16262 (ANL-HEP-CP—80-62) QCD corrections to neutrino charm production. Gottschalk, T. (Argonne National Lab., IL (USA)). Aug 1980. Contract W-31-109-ENG-38. 4p. (CONF-800724—68). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Some results of the O(/α//sub s/) chromodynamic corrections to neutrino-production of heavy quarks are summarized. (GHT)

16263 (ANL-HEP-CP—80-63) Review of N-N scattering. Yokosawa, A. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 5p. (CONF-800724—69). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

Structures appearing in various experimental data (particularly those with polarized beams) in nucleon-nucleon systems are reviewed. A number of candidates are presented for dibaryon resonances which can couple to nucleon-nucleon systems. The present status of experimental data in the nucleon-nucleon system is discussed. Details of N-N scattering are written elsewhere, and here relatively new aspects are presented.

6453 Particle Invariance Principles And Symmetries

REFER ALSO TO CITATION(S) 16239

6454 Field Theory

16264 (ANL-HEP-CP—79-42) Components of QCD. Sivers, D. (Argonne National Lab., IL (USA)). Oct 1979. Contract W-31-109-ENG-38. 50p. (CONF-8010167—1). NTIS, PC A03/MF A01.

From Topical workshop on the production of new particles in super-high energy collisions; Madison, WI, USA (22 Oct 1980).

Some aspects of a simple strategy for testing the validity of QCD perturbation theory are examined. The importance of explicit evaluation of higher-order contributions is illustrated by considering Z_0 decays. The recent progress toward understanding exclusive processes in QCD is discussed and some simple examples are given of how to isolate and test the separate components of the perturbation expansion in a hypothetical series of jet experiments.

16265 (BNL—29048) Numerical techniques for lattice gauge theories. Creutz, M. (Brookhaven National Lab., Upton, NY (USA)). 6 Feb 1981. Contract AC02-76CH00016. 44p. NTIS, PC A03/MF A01.

The motivation for formulating gauge theories on a lattice is reviewed. Monte Carlo simulation techniques are then discussed for these systems. Finally, the Monte Carlo methods are combined with renormalization group analysis to give strong numerical evidence for confinement of quarks by non-Abelian gauge fields.

16266 Solitons. Rebbi, C. (Brookhaven National Lab., Upton, NY (USA)). *Uspekhi Fizicheskikh Nauk ;* **130**: No. 2, 329-356(Feb 1980). (In Russian).

The survey devoted to study of solitons is presented. Production and annihilation of solitons are considered. Presented is the energy surface of the sine-Gordon field describing topological restrictions guaranteeing soliton stability. The optimal form of the soliton is under study. The possibilities for soliton formation and stability in two-dimensional space are explained. The change of soliton description in two and three dimensions in colibrated fields is considered. The nature of instanton is described and its role in formation of structure of quantum mechanical vacuum is analyzed.

65 PHYSICS RESEARCH

6510 Nuclear Physics

REFER ALSO TO CITATION(S) 15664

16267 (INIS-mf—6088) Gross properties of nuclei and nuclear excitations. Proceedings. Feldmeier, H. (ed.). (Bundesministerium fuer Forschung und Technologie, Bonn-Bad Godesberg (Germany, F.R.); Technische Hochschule Darmstadt (Germany, F.R.). Inst. fuer Kernphysik). Feb 1980. 217p. (CONF-800121—). NTIS (US Sales Only), PC A10/MF A01.

From Workshop on gross properties of nuclei and nuclear excitations; Hirschegg, Austria (14 Jan 1980).

Papers from this workshop were processed individually for the data base as they were received from INIS. (RWR)

16268 (INKA-Conf—79-001-000) Gross properties of nuclei and nuclear excitations. Proceedings. Pt. A: Nuclear collisions. Feldmeier, H. (ed.). (Bundesministerium fuer Forschung und Technologie, Bonn-Bad Godesberg (Germany, F.R.); Technische Hochschule Darmstadt (Germany, F.R.). Inst. fuer Kernphysik). Feb 1979. 235p. (CONF-790140—(Pt.A)). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.

From International workshop on gross properties of nuclei and nuclear excitations VII; Hirschegg, Kleinwalsertal, Austria (15 Jan 1979).

Papers from this workshop were processed individually for the data base as they were received from INIS. (RWR)

16269 **(ORNL—5725) Engineering Physics Division progress report for period ending November 30, 1980.** (Oak Ridge National Lab., TN (USA)). Dec 1980. Contract W-7405-ENG-26. 319p. NTIS, PC A14/MF A01.

Separate abstracts are included for sections concerning measurement of nuclear cross sections and related quantities; nuclear cross-section evaluations and theory; nuclear cross-section processing, testing, and sensitivity analysis; engineering physics division integral experiments and their analyses; development of methods for shield and reactor analysis; analyses for specific systems or applications; energy model validation; systems reliability and operations research; and information analysis and distribution.

16270 (ORNL—5725, pp 1.1-1.22) **Measurements of nuclear cross sections and related quantities.** Dec 1980.

In Engineering Physics Division progress report for period ending November 30, 1980.

The ORELA continues to be a major world source of nuclear data for fusion reactor development as well as for fission reactor design. Work includes not only neutron and gamma-ray emission spectra similar to those measured in the past, but also some cross sections for neutron energies up to several ten's of MeV. A series of papers has covered work on subthreshold neutron fission. The program to obtain definitive measurements of the ^{252}Cf (spontaneous fission) standard for the number of neutrons emitted per fission and the energy dependence of anti ν for the major isotopes is far along. The significant results of the fission-product decay heat program have now all been sent for publication. For the ORELA itself, development efforts continue on the electron injection system in hopes of compressing the charge that can be accelerated into as narrow a pulse as possible. The effort to obtain this result using klystron prebunching has not yet become operational because of extensive vacuum problems in the ferrite-loaded acceleration and deceleration gaps constructed for this purpose. Tests performed with a fraction of the structures in operation have indicated that a significant share of the expected pulse compression can be achieved, but to date the full system has not been demonstrated even on a trial basis. The 39 items in this section are exclusively abstracts of papers that were indexed completely as they were received. (RWR)

16271 **(DOE/ER/03624—21) TUNL XIX. Annual report, January 1-December 31, 1980.** (Triangle Universities Nuclear Lab., Durham, NC (USA)). [nd]. 235p. NTIS, PC A11/MF A01.

Research performed by North Carolina State University personnel at TUNL is highlighted in this report, which is actually the complete TUNL progress report for 1980. Studies in the areas of neutron cross sections, neutron polarization, radiative capture, atomic physics and development activities are included. One may expect completed projects to be reported in physics journals or conference proceedings. (RWR)

6511 Experimental Techniques

16272 **Experimental capabilities - present and future.** Zafiratos, C.D. (Univ. of Colorado, Boulder). Contract DE-AC02-76ER-00535. pp 313-332 of (p,n) reaction and the nucleon-nucleon force. Goodman, C.D.; Austin, S.M.; Bloom, S.D.; Rapaport, J.; Satchler, G.R. (eds.). New York, NY; Plenum Publishing Corporation (1980).

Existing experimental capabilities for the study of (p,n) reactions at energies that are clearly in the direct-reaction regime are described. Due to the unification of (p,p), (p,n), (n,p), and (n,n) reactions under an isospin formalism, some slight attention is also given to (n,n) and (n,p) capabilities at appropriate energies. Then new developments that will enhance experimental capabilities in the future are pointed out. Some of these new developments involve improved accelerator technology, and some, improved neutron detection techniques. 11 figures. (RWR)

6512 Nuclear Properties And Reactions, A=1-5

REFER ALSO TO CITATION(S) 16275

6513 Nuclear Properties And Reactions, A=6-19

REFER ALSO TO CITATION(S) 16276

16273 **(RLO—1388-844) Excitation of shape-vibrational modes in nuclei by relativistic heavy ions.** Rasmussen, J.O.; Blair, J.S.; Qiu, X.J. (Lawrence Berkeley Lab., CA (USA); Washington Univ., Seattle (USA). Dept. of Physics; California Univ., Santa Barbara (USA). Dept. of Physics). 1980. Contract AC06-76ER01388. 15p. (CONF-8009136—1). NTIS, PC A02/MF A01.

From Workshop in nuclear physics; Philadelphia, PA, USA (1 Sep 1980).

Data on excitation of collective 2^+ and 3^- states in relativistic ($\geq$ 250 MeV/N) heavy-ion collisions are reviewed. Indirect evidence on excitation to the giant quadrupole region of ^{16}O at 2 GeV/N is put forward. Our theoretical approach uses the diffuse-edge diffraction model. A microscopic model is used to relate the elemental nucleon-nucleon total cross section to the nuclear transparency parameters for the diffraction model. The integrated inelastic cross sections are approximately inversely proportional to the thickness of the diffuse partial transmission region. Coulomb excitation of giant quadrupole states in the projectile appears to be negligible in comparison to the excitation produced by nuclear interactions.

16274 **Mass measurements with pion double charge exchange.** Nann, H. (Northwestern Univ., Evanston, IL). pp 51-59 of Atomic masses and fundamental constants. Nolen, J.A. Jr.; Benenson, W. (eds.). New York, NY; Plenum Publishing Corporation (1980).

A brief review of the history of double charge exchange measurements leads to a discussion of the experimental methods employed; the emphasis is on the EPICS facility at LASL. Both the (π^+, π^-) and (π^-, π^+) reactions have been used to study the properties of nuclei far from stability; in particular, the masses of T/sub Z/=3 nuclei, ^9He, and isobaric mass quintets are discussed. 4 figures, 5 tables. (RWR)

16275 **Polarization observables in (p,n) reactions.** Walter, R.L.; Byrd, R.C. (Duke Univ., Durham, NC). pp 469-480 of The (p,n) reaction and the nucleon-nucleon force. Goodman, C.D.; Austin, S.M.; Bloom, S.D.; Rapaport, J.; Satchler, G.R. (eds.). New York, NY; Plenum Publishing Corporation (1980).

In (p,n) reactions, three parameters have been measured that involve polarized incident proton beams, polarized outgoing neutron beams, or both. The data that have been obtained and the conclusions that have been based on those data are reviewed. The discussion is limited to experiments below 30 MeV. The three parameters discussed are the polarization transfer coefficient K/sub y// sup y/(0°), which connects the transverse polarization in the outgoing neutron beam to the transverse polarization in the incident proton beam; the (transverse) polarization P/sup y/ (θ) of the outgoing neutron beam, which is produced by incident unpolarized protons; and the asymmetry parameter A/sub y/(θ), which is a measure of the ratio of the cross section at the reaction angle on the left side of the reaction plane to that on the right side for a reaction induced with an incident polarized beam. 8 figures (RWR)

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 16274, 16275

16276 **(p,n) reaction at intermediate energy.** Goodman, C.D. (Oak Ridge National Lab., TN). pp 149-177 of (p,n) reaction and the nucleon-nucleon force. Goodman, C.D.; Austin, S.M.; Bloom, S.D.; Rapaport, J.; Satchler, G.R. (eds.). New York, NY; Plenum Publishing Corporation (1980).

The use of the (p,n) reaction in exploring effective interactions is reviewed. Some new data from the Indiana University Cyclotron Facility (IUCF) are shown, and the differences between low- and high-energy data are emphasized. Experimental problems and techniques in use at IUCF are briefly discussed. 27 figures, 2 tables. (RWR)

6516 Nuclear Properties And Reactions, A=59-89

REFER ALSO TO CITATION(S) 16275, 16277

6517 Nuclear Properties And Reactions, A=90-149

REFER ALSO TO CITATION(S) 15920, 16275

16277 **(DOE/ER/10493—3) Atomic mass measurements and nuclear spectroscopy at TRISTAN. Progress report, July 1, 1980-January 31, 1981.** Brenner, D.S. (Clark Univ., Worcester, MA (USA)). Feb 1981. Contract AC02-79ER10493. 14p. NTIS, PC A02/MF A01.

This research program is concerned with measuring atomic masses and decay schemes of short-lived, neutron-rich fission products with the TRISTAN on-line mass separator located at the High Flux Beam Reactor (HFBR), Brookhaven National Laboratory. The determination of accurate masses for neutron-rich nuclei is useful in refining mass equations wich, in turn, are important for calculations related to astrophysical processes and to control and safety of nuclear reactors. During the period covered by this report, efforts have been to aid Brookhaven personnel in the installation and testing of TRISTAN and the associated computer systems, and to begin a program of measurements of β-ray end-point energies and nuclear decay schemes following successful demonstration of the facility. 2 figures.

6520 Nuclear Properties And Reactions, A=220 And Above

16278 **(DOE/ER/10452—5) High-resolution photofission measurements in ^{238}U and ^{232}Th. Progress report, June 1, 1980-February 10, 1981.** Lancman, H. (Brooklyn Coll., NY (USA)). Feb 1981. Contract AC02-79ER10452. 6p. NTIS, PC A02/MF A01.

Intense proton beam currents from the Dynamitron at Brooklyn College have been used to generate gamma rays of variable energy from a number of (p,γ) resonances in various nuclei. Spectra of photofission fragments of ^{238}U and ^{232}Th have been measured with an average gamma ray energy resolution of $\sim$ 300 eV. Structure in the photofission cross section of ^{232}Th was observed at $\sim$ 6176 keV.

6530 Nuclear Theory

REFER ALSO TO CITATION(S) 16291

16279 **(CONF-800787—1) Hadron nucleus interactions.** Feshbach, H. (Massachusetts Inst. of Tech., Cambridge (USA)). Oct 1980. Contract AC02-76ER03069. 108p. NTIS, PC A06/MF A01.

From International school of physics enrico fermi; Varenna, Lake Como, Italy (Jul 1980).

The elastic and inelastic scattering of intermediate energy ($\leqq$ 1 GeV) protons by nuclei is considered first. The discussion focuses on the determination of the proton-nucleus optical potential in terms of the elementary nucleon-nucleon scattering amplitudes and the properties of the target and residual nucleus. The result is a series of terms for the optical potential. Then the interaction of pions with nuclei for energies in the neighborhood of the Δ-resonance is discussed. In this energy domain an incident pion will with high probability be absorbed by a nucleon to produce the Δ-resonance and thus form a Δ-particle hole state in the nucleus. Next, the subject of hypernuclei is taken up. The Λ hypernuclei and a recently observed Σ hypernuclei comprise situations in which the core nucleus can be probed by a baryon of roughly the same mass as a nucleon, with similar albeit not identical interactions with nucleons. But the Λ (or Σ) does not need to satisfy the Pauli exclusion principle with respect to the nucleons, and therefore can be in orbits forbidden to it if it were a nucleon. As the energy of the projectile increases, it becomes correspondingly more important to take relativistic effects into account. The importance of these effects is strikingly revealed by experiments involving the collision of ultrarelativistic hadrons, protons, pions, kaons (up to Fermilab energies) with nuclei. This phenomenon forms part of the final topic, which includes as well as the collision of relativistic heavy ion projectiles with nuclei. A nuclear Weiszaecker-Williams method developed for dealing with peripheral collisions is described. 32 figures, 10 tables. (RWR)

16280 **(CONF-810107—3) Quantum mean-field theory of collective dynamics and tunneling.** Negele, J.W. (Massachusetts Inst. of Tech., Cambridge (USA)). Jan 1981. Contract AC02-76ER03069. 10p. NTIS, PC A02/MF A01.

From 2. international conference on recent progress in many-body theories; Mexico City, Mexico (12 Jan 1981).

A fundamental problem in quantum many-body theory is formulation of a microscopic theory of collective motion. For self-bound, saturating systems like finite nuclei described in the context of nonrelativistic quantum mechanics with static interactions, the essential problem is how to formulate a systematic quantal theory in which the relevant collective variables and their dynamics arise directly and naturally from the Hamiltonian and the system under consideration. Significant progress has been made recently in formulating the quantum many-body problem in terms of an expansion about solutions to time-dependent mean-field equations. The essential ideas, principal results, and illustrative examples are summarized. An exact expression for an observable of interest is written using a functional integral representation for the evolution operator, and tractable time-dependent mean field equations are obtained by application of the stationary-phase approximation (SPA) to the functional integral. Corrections to the lowest-order theory may be systematically enumerated. 6 figures. (RWR)

16281 (ORNL—5725, pp 2.1-2.9) **Nuclear cross-section evaluations and theory.** Dec 1980.

In Engineering Physics Division progress report for period ending November 30, 1980.

The major cross-section evaluation efforts have been to assess the adequacy of the recently released fifth version of the official evaluated nuclear data file (ENDF/B-V), to document the contributions of our group to the file, to patch up weak points in the file's coverage, and to develop improved evaluation techniques for inclusion of theoretical information and for the combination of experimental measurements. For incident neutron energies above $\sim$ 10 MeV, the secondary and tertiary reactions observed become sufficiently complex, and the available detail in the experimental observations becomes so sparse, that evaluators rely on evaluation codes, aggregates of nuclear model codes, to keep track of knowledge available through nuclear models and allow determination of all the necessary cross-section detail while maintaining consistency with any directly pertinent experimental data. The 16 items in this section consist entirely of abstracts of papers that were indexed from the complete paper. (RWR)

16282 **(SLAC-PUB—2667) Quark structure of nuclei.** Blankenbecler, R. (Stanford Linear Accelerator Center, CA (USA)). Jan 1981. Contract AC03-76SF00515. 23p. (CONF-810115—5). NTIS, PC A02/MF A01.

From Nuclear and particle physics at energies up to 31 GeV: new and future aspects conference; Los Alamos, NM, USA (Jan 1981).

A brief review is given of selected topics involved in the relativistic quark structure of nuclei such as the infinite momentum variables, scaling variables, counting rules, forward-backward variables, thermodynamic-like limit, QCD effects, higher quark bags, confinement, and many unanswered questions.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 15698, 16269

16283 (BNL—28989) Inelastic neutron scattering studies of single crystal TmSe. Grier, B.H.; Shapiro, S.M. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 4p. (CONF-810129—1). NTIS, PC A02/MF A01.

From Conference on valence fluctuations in solids; Santa Barbara, CA, USA (27 Jan 1981).

Inelastic neutron scattering studies have been performed on a single crystal of stoichiometric (a = 5.71 A)TmSe. They confirm previous measurements performed on a polycrystalline sample which showed an inelastic line at $h\omega \cong 1$ MeV for T < T/sub N/ = 3.0 K. The energy of the 10 MeV line exhibits weak dispersion across the Brillouin zone, while the intensity and linewidth show a stronger q vector dependence. The excitation is broader and less intense near the zone center than at the zone boundary. This feature results from the excitation of f-electrons across the hybridization gap formed when the localized f-electrons hybridize with the conduction band. The temperature and q vector dependences are consistent with a recent theoretical calculation of the neutron cross section for this case.

6550 Medical Physics

REFER ALSO TO CITATION(S) 16170

6560 Solid State Physics

REFER ALSO TO CITATION(S) 16243

16284 (BNL—28946) EXAFS of dilute systems: fluorescence detection. Hastings, J.B. (Brookhaven National Lab., Upton, NY (USA)). 1979. Contract AC02-76CH00016. 20p. (CONF-7911139—1). NTIS, PC A02/MF A01.

From Applications of EXAFS to materials science conference; Boston, MA, USA (26 Nov 1979).

Since the first observations of the variation of the absorption coefficient for x-rays above the energy thresholds in the thirties until the early seventies, measurements and analysis of these variations were merely intended for the understanding of the underlying physics. Recently, with the understanding of the information available about the local atomic structure in the neighborhood of the absorbing species and the availability of high intensity synchrotron radiation sources, EXAFS has become a powerful structural tool. In these discussions, the details of the measurements for very dilute species are presented. It is shown that for the more dilute systems the measurement of the emission rather than the direct absorption is a more favorable technique.

16285 (LA—8706-MS) Spectral absorption shifts in CuCl vs pressure to 147 kbar. Liebenberg, D.H.; Hudson, J. (Los Alamos Scientific Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 8p. NTIS, PC A02/MF A01.

Measurements of the absorption of CuCl in the spectral region 200 to 800 nm are reported as a function of pressure to 147 kbar. In this region, phase transitions are identified with the abrupt changes of the absorption cutoff, the pressure dependence of the cutoff is determined, and a log-linear response is found for the absorption with photon energy. The measurements are compared with recent published data and indicate a new anomaly for the band gap in our sample at high pressures.

16286 (LA-UR—81-467) Variational ground states, magnetic responses, and dilution behavior of model valence-fluctuation systems. Brandow, B.H. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810129—2). NTIS, PC A02/MF A01.

From Conference on valence fluctuations in solids; Santa Barbara, CA, USA (27 Jan 1981).

Variational ground-state wavefunctions are presented and optimized for two model valence-fluctuation systems. One system exhibits an intuitively reasonable groundstate magnetic susceptibility, while the other is found to have an insulating gap. In view of their different crystal structures, this gap should be realized in SmB_6 but not in SmS, in agreement with experiment. One of these model systems is analyzed for diluted cases, where only a fraction of the sites contain valence-fluctuation cations, and connections are made with several Kondo theoretic results.

16287 (LBL—12154) Theoretical aspects of four-wave mixing spectroscopy with multiple resonances. Oudar, J.L.; Shen, Y.R. (California Univ., Berkeley (USA). Dept. of Physics; Centre National d'Etudes des Telecommunications (CNET), 92 - Bagneux (France)). Jan 1981. 7p. (CONF-810312—2). NTIS, PC A02/MF A01.

From International conference on excited states and multiresonance nonlinear optical process in solids; Modane, France (18 Mar 1981).

The use of multiresonant four-wave mixing processes in solid-state spectroscopy is analyzed in detail. Specific information on the excited states of solids can be obtained from such techniques, including the reduction of inhomogeneous broadening, study of transitions between excited states, determination of ultrafast relaxation times through measurements in the frequency domain.

16288 Photosensitivity enhancement of PLZT ceramics by positive ion implantation. Peercy, P.S.; Land, C.E. (to Dept. of Energy). US Patent Application 159,318. 13 Jun 1980. 21p.

The photosensitivity of lead lanthanum zirconate titanate (PLZT) ceramic material used in high resolution, high contrast, and non-volatile photoferroelectric image storage and display devices is enhanced significantly by positive ion implantation of the PLZT near its surface. Ions that are implanted include H^+, He^+, Ar^+, and a preferred co-implant of Ar^+ and Ne^+. The positive ion implantation advantageously serves to shift the band gap energy threshold of the PLZT material from near-uv light to visible blue light. As a result, photosensitivity enhancement is such that the positive ion implanted PLZT plate is sensitive even to sunlight and conventional room lighting, such as fluorescent and incandescent light sources. The method disclosed includes exposing the PLZT plate to these positive ions of sufficient density and with sufficient energy to provide an image. The PLZT material may have a lanthanum content ranging from 5 to 10%; a lead zirconate content ranging from 62 to 70 mole %; and a lead titanate content ranging from 38 to 30%. The region of ion implantation is in a range from 0.1 to 2 microns below the surface of the PLZT plate. Density of ions is in the range from 1×10^{12} to 1×10^{17} ions/cm^2 and having an energy in the range from 100 to 500 keV.

6561 Superconductivity

16289 (IS-T—935) Theory of flux-flow voltage noise in type-II superconductors. Shuk-Yu Li, P. (Ames Lab., IA (USA)). Feb 1981. 130p. NTIS, PC A07/MF A01.

Thesis submitted to Iowa State Univ.

A theory for the flux-flow voltage noise in a type-II superconductor in the mixed state is developed. The interactions between the vortices are taken into account via a wavevector-dependent interaction matrix. Applied to Johnson noise in a film without flux flow for a special measuring circuit, the theory predicts a suppression of the power spectrum at low frequencies. For flux-flow noise produced when a perfect vortex lattice moves in a superconducting foil or film containing a random array of independent pinning centers, the theory gives two contributions to the power spectrum: one from transverse velocity fluctuations, which has a characteristic frequency determined by the characteristic frequency of the power spectrum of the elementary pinning force; the other from longitudinal density fluctuations, which may have a characteristic frequency determined by the elastic constants and the geometry of the measuring circuit. Both of these frequencies are much higher than experimentally observed values.

6570 Theoretical Physics

16290 (DOE/ER/01198—1341) Correlated BCS theory. Fantoni, S. (Illinois Univ., Urbana (USA)). 1981. Contract AC02-76ER01198. 6p. (CONF-810107—4). NTIS, PC A02/MF A01.

From 2. international conference on recent progress in many-body theories; Mexico City, Mexico (12 Jan 1981).

A variational theory of the BCS pair-condensed state of strongly-interacting Fermi system is briefly outlined. An FHNC scheme is devised to calculate the radial distribution function and the one- and the two-body density matrices.

16291 (LA-UR—81-403) Effective Hamiltonian theory: recent formal results and non-nuclear applications. Brandow, B.H. (Los Alamos Scientific Lab., NM (USA)). 1981. 10p. (CONF-810107—2). NTIS, PC A02/MF A01.

From 2. international conference on recent progress in many-body theories; Mexico City, Mexico (12 Jan 1981).

Effective Hamiltonian theory is discussed from the points of view of the unitary transformation method and degenerate perturbation theory. It is shown that the two approaches are identical term by term. The main features of a formulation of the coupled-cluster method for open-shell systems are outlined. Finally, recent applications of the many-body linked-cluster form of degenerate perturbation theory are described: the derivation of effective spin Hamiltonians in magnetic insulator systems, the derivation and calculation ab initio of effective π-electron Hamiltonians for planar conjugated hydrocarbon molecules, and understanding the so-called valence fluctuation phenomenon exhibited by certain rare earth compounds. (RWR)

16292 Stochastic behavior in classical and quantum hamiltonian systems. Casati, G.; Ford, J. (eds.). Berlin, Germany; Springer-Verlag (1979). 383p. (CONF-770692—). Springer-Verlag, New York, NY.

From International conference on stochastic behavior and quantum hamiltonian systems; Como, Italy (20 Jun 1977).

Twenty-six of the papers presented at the conference are given here. Three of these have already been cited in ERA, and can be found by reference to the entry CONF-770692-- in the Report Number Index. Separate abstracts have been prepared for five others. The remaining papers in scope for the TIC data base will be added when they are received from INIS. (RWR)

6580 Mathematical Physics

REFER ALSO TO CITATION(S) 16340

70 FUSION ENERGY

16293 (DOE/ET/52049—12) International aspects of fusion. Stacey, W.M. Jr. (Georgia Inst. of Tech., Atlanta (USA). School of Nuclear Engineering). Dec 1979. Contract AS05-79ET52049. 7p. (CONF-800210—5). NTIS, PC A02/MF A01.

From IEEE Region 6 conference; San Diego, CA, USA (20 Feb 1980).

International collaborative efforts in magnetic confinement fusion in which the USA is involved are reviewed. These efforts are carried under the auspices of international agencies and through bilateral agreements.

7001 Plasma Research

REFER ALSO TO CITATION(S) 15652

16294 (CONF-800932—8) Thermal energy diffusion in plasmas with weak ohmic heating. Coppi, B. (Massachusetts Inst. of Tech., Cambridge (USA)). Oct 1980. Contract AS02-78ET53073. 6p. NTIS, PC A02/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The diffusion coefficient for the electron thermal energy was found to reproduce well a relatively large variety of experiments in which most of the electron heating is ohmic. An analysis of the diffusion coefficient is given. (MOW)

16295 (COO—4001-8) Quantitative measurements in laser-induced plasmas using optical probing. Final report. Sweeney, D.W. (Purdue Univ., Lafayette, IN (USA). School of Mechanical Engineering). Jan 1981. Contract AS02-76DP40048. 35p. NTIS, PC A03/MF A01.

Optical probing of laser induced plasmas can be used to quantitatively reconstruct electron number densities and magnetic fields. Numerical techniques for extracting quantitative information from the experimental data are described. A computer simulation of optical probing is used to determine the quantitative information that can be reasonably extracted from real experimental interferometric systems to reconstruct electron number density distributions. An example of a reconstructed interferogram shows a steepened electron distribution due to radiation pressure effects.

16296 (LA—7941-MS) X-ray diodes for laser fusion plasma diagnostics. Day, R.H.; Lee, P.; Saloman, E.B.; Nagel, D.J. (Los Alamos Scientific Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 24p. NTIS, PC A02/MF A01.

Photodiodes with x-ray sensitive photocathodes are commonly used as broadband x-ray detectors in fusion plasma diagnostics. We have measured the risetime of the detector system and have measured the quantum efficiency between 1 to 500 A of numerous photocathode materials of practical interest. The materials studied include aluminum, copper, nickel, gold, three forms of carbon, chromium, and cesium iodide. The results of the measurements are compared with Henke's semiempirical model of photoyield. We have studied the effects of long-term cathode aging and use as a plasma diagnostic on cathode quantum efficiency. In addition, we have measured the x-ray mass-absorption coefficient of several ultrasoft x-ray windows in energy regions where data were unavailable. Windows studied were made of aluminum, Formvar, polypropylene, and Kimfoil. Measurements between 1 to 50 A were performed with the Los Alamos Scientific Laboratory's low-energy x-ray calibration facility, and the measurements between 50 to 550 A were performed at the National Bureau of Standard's synchrotron ultraviolet radiation facility.

16297 (LA-UR—81-621) Improved diffusion. Doolen, G.D. (Los Alamos Scientific Lab., NM (USA)). 1980. 7p. (CONF-801183—1). NTIS, PC A02/MF A01.

From Conference on hot dense matter; Monterey, CA, USA (Nov 1980).

Plasma effects are shown to decrease both the magnitude of the transverse photon energy density and the rate of diffusion of this energy.

16298 (PPPL—1750) Alfven wave cyclotron resonance heating. White, R.B.; Yosikawa, S.; Oberman, C. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Feb 1981. Contract AM02-76CH03073. 21p. NTIS, PC A02/MF A01.

The resonance absorption of fast Alfven waves at the proton ctclotron resonance of a predominately deuterium plasma is investigated. An approximate dispersion relation is derived, valid in the vicinity of the resonance, which permits an exact calculation of transmission and reflection coefficients. For reasonable plasma parameters significant linear resonance absorption is found.

16299 (PPPL—1754) Modeling of ICRF heating in PLT. Colestock, P.L.; Davis, S.L.; Hosea, J.C.; Hwang, D.Q.; Thompson, H.R. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Feb 1981. Contract AM02-76CH03073. 20p. NTIS, PC A02/MF A01.

Significant heating with the fast magnetosonic wave near the ion cyclotron frequency has been demonstrated in the present generation of tokamaks. Effective wave absorption and heating can be achieved either by using the second harmonic or by heating at the fundamental of a minority ion component. Recent experiments in PLT have facilitated the refinement of a heating model which both shows good agreement with experiment and predicts favorable scal-

ing to hotter, denser plasmas. Details of the model, including full wave theory, power deposition, Fokker-Planck theory, and scaling are discussed.

16300 **(PPPL—1767) Hydrogen isotope analysis by quadrupole mass spectrometry.** Ellefson, R.E.; Moddeman, W.E.; Dylla, H.F. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Mar 1981. Contract AM02-76CH03073. 29p. NTIS, PC A03/MF A01.

The analysis of isotopes of hydrogen (H, D, T) and helium (^{3}He, ^{4}He) and selected impurities using a quadrupole mass spectrometer (QMS) has been investigated as a method of measuring the purity of tritium gas for injection into the Tokamak Fusion Test Reactor (TFTR). A QMS was used at low resolution, $m/\Delta m < 150$, for quantifying impurities from $m/q = 2$ to 44, and at medium resolution, $m/\Delta m \sim 600$, for determining concentrations of HD in ^{3}He, and ^{4}He in HT/D_2.

16301 **(UCRL—85246) Survey of ion-acoustic-instability particle simulations and relevance to laser-fusion thermal-transport inhibition.** Mead, W.C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 11 Sep 1980. Contract W-7405-ENG-48. 19p. (CONF-7908142—1). NTIS, PC A02/MF A01.

From CECAM workshop on fast electron transport; Orsay, France (14 Aug 1979).

Ion acoustic turbulence is examined as one mechanism which could contribute to the inhibition of electron thermal transport which has been inferred from many laser-plasma experiments. The behavior of the ion acoustic instability is discussed from the viewpoint of the literature of 2-dimensional particle-in-cell simulations. Simulation techniques, limitations, and reported saturation mechanisms and levels are discussed. A scaling law for the effective collision frequency ν^* can be fit to several workers' results to within an order-of-magnitude. The inferred ν^* is shown to be 1-2 orders-of-magnitude too small to account for the transport inhibition seen in Nd-laser-produced plasmas. Several differences between the simulation conditions and laser-produced plasma conditions are noted.

16302 **(UCRL—85491) FERMI: a code for modeling field-reversed magnetic-mirror fusion devices.** Brengle, T.A.; Cohen, B.I. (Lawrence Livermore National Lab., CA (USA)). 1 Feb 1981. 11p. (CONF-810424—1). NTIS, PC A02/MF A01.

From ARRAY user's annual conference; St Louis, MO, USA (26 Apr 1981).

We present the design and implementation for the array processor of FERMI, a code for modeling the physics of field-reversed magnetic-mirror fusion machines. The physical model is described briefly, along with a discussion of important physical effects that this code can model. We show that the code results are in agreement with theoretical predictions.

16303 **(SAND—81-6005) Optimization of a high-voltage plasma focus machine.** Flemming, L. (Sandia National Labs., Albuquerque, NM (USA)). 17 Feb 1981. Translation of IPF-INT-77-A. 99p. NTIS, PC A05/MF A01.

The results of the parameter studies, stated briefly, are as follows: in order to attain high neutron yields it is necessary to optimize the four geometric quantities l/sub i/, r/sub i/, r/sub a/ and l/sub a/ and the filling pressure p_0 with one another. The pressure tuning required in each case proved to be a less critical quantity; 10% deviation from optimum p_0 did not noticeably decrease the neutron yield. For a bank energy $W_0 = 9$ kJ, two pressure ranges at two different anode lengths were found with practically the same mean values.

16304 **Two-dimensional eigenmode analysis of the trapped-ion instability.** Marchand, R. Princeton, NJ; Princeton Univ. (1979). 197p. University Microfilms Order No. 79-28,481.

Thesis (Ph. D.).

We present the first fully two-dimensional eigen-mode analysis of the trapped-ion instability in an axisymmetric toroidal geometry. Although attention is focused on this particular instability, the calculation also takes into account the basic dynamics associated with other low frequency modes such as the trapped-electron instability and the ion-temperature-gradient instability. The poloidal structure of the mode is taken into account by Fourier expanding the perturbed electrostatic potential, PHI, in θ. Assuming that the perturbation varies mildly over a typical ion-banana-width, rho/sub bi/, each poloidal harmonic is then expressed as a truncated Taylor series in the minor radius to account for the radial structure. The resulting set of coupled ordinary second order differential equation is solved by the method of finite elements after prescribing the appropriate boundary conditions.

16305 **Adiabatic and stochastic motion of charged particles in the field of a single wave.** Lichtenberg, A.J. pp 18-34 of Stochastic behavior in classical and quantum hamiltonian systems. Casati, G.; Ford, J. (eds.). Berlin, Germany; Springer-Verlag (1979).

From International conference on stochastic behavior and quantum hamiltonian systems; Como, Italy (20 Jun 1977).

A unified treatment of particle motion in a wave field is presented for both propagation oblique to a magnetic field and propagation across a magnetic field. It is shown that both cases are related to the dynamical motion of two nonlinear coupled oscillators the frequencies of which are harmonically related at some values of their actions. The oblique propagation corresponds to accidental degeneracy of the coupled oscillators for which the oscillator frequencies are functions of the action in the absence of the perturbation. The motion with perpendicular propagation corresponds to intrinsic degeneracy for which the nonlinearity occurs only in the coupling terms. For the former case islands in the phase space trajectories are formed around the resonant actions with the ratio of the bounce to cyclotron frequency Ω/sub B/Ω proportional to ϵ/sup 1/2/ and the island amplitude Δp/sub M/ proportional to ϵ/sup 1/2/, where ϵ is the coupling parameter. In the latter case Ω/sub B//Ω proportional to ϵ and Δp/sub M/ proportional to 1. For both cases coupled oscillator theory predicts overlap ($2\Delta p$/sub M//$\delta p = 1$, where δp is the resonance separation) at Ω/sub B//$\Omega = 1/4$. With similar parameters this implies overlap at smaller coupling for accidental degeneracy, although the use of practical parameters, corresponding to real plasma waves, may reverse this situation. The importance of second-order resonances in leading to stochasticity is demonstrated by showing that the second-order islands are exponentially small for small Ω/sub B//Ω, but that the ratio of the second-order island width to their separation becomes comparable to the first-order island ratio near overlap. The result is a nearly complete randomization of the trajectories in the phase plane near Ω/sub B//$\Omega = 1/4$, leading to stochasticity and heating.

16306 **Stochastic ion heating by a perpendicularly propagating electrostatic wave.** Karney, C.F.F.; Bers, A. (Massachusetts Inst. of Tech., Cambridge). pp 44-50 of Stochastic behavior in classical and quantum hamiltonian systems. Casati, G.; Ford, J. (eds.). Berlin, Germany; Springer-Verlag (1979).

From International conference on stochastic behavior and quantum hamiltonian systems; Como, Italy (20 Jun 1977).

The motion of an ion in the presence of a constant magnetic field and a perpendicularly propagating electrostatic wave with frequency several times the ion cyclotron frequency is shown to become stochastic for fields satisfying $E/B_0 > 1/4(\Omega/\omega)$/sup 1/3/ (ω/k). This stochasticity condition is independent of how close ω is to a cyclotron harmonic. Applications of current interest in supplementary heating of plasmas with rf power near the lower-hybrid frequency are suggested. 3 figures.

7002 Fusion Power Plant Technology

REFER ALSO TO CITATION(S) 15652, 15662, 16295, 16296

16307 **(ANL/FPP/TM—138) D-D tokamak reactor studies.** Evans, K.E. Jr.; Baker, C.C.; Brooks, J.N.; Ehst, D.A.; Finn, P.A.; Jung, J.; Mattas, R.F.; Misra, B.; Smith, D.L.; Stevens, H.C. (Argonne National Lab., IL (USA)). Nov 1980. Contract W-31-109-ENG-38. 111p. NTIS, PC A06/MF A01.

A tokamak D-D reactor design, utilizing the advantages of a deuterium-fueled reactor but with parameters not unnecessarily ex-

tended from existing D-T designs, is presented. Studies leading to the choice of a design and initial studies of the design are described. The studies are in the areas of plasma engineering, first-wall/blanket/shield design, magnet design, and tritium/fuel/vacuum requirements. Conclusions concerning D-D tokamak reactors are stated.

16308 **(DOE/ET/52017—4) Methods of economic analysis applied to fusion research. Fourth annual report.** Hazelrigg, G.A. Jr. (ECON, Inc., Princeton, NJ (USA)). 31 Dec 1980. Contract AC02-77ET52017. 79p. NTIS, PC A05/MF A01.

The current study reported here has involved three separate tasks. The first task deals with the development of expected utility analysis techniques for economic evaluation of fusion research. A decision analytic model is developed for the incorporation of market uncertainties, as well as technological uncertainties in an economic evaluation of long-range energy research. The model is applied to the case of fusion research. The second task deals with the potential effects of long-range energy RD and D on fossil fuel prices. ECON's previous fossil fuel price model is extended to incorporate a dynamic demand function. The dynamic demand function supports price fluctuations such as those observed in the marketplace. The third task examines alternative uses of fusion technologies, specifically superconducting technologies and first wall materials to determine the potential for alternative, nonfusion use of these technologies. In both cases, numerous alternative uses are found.

16309 **(LA—8716-MS) Observations of separatrix motion during the formation of a field-reversed configuration.** Cochrane, J.C.; Armstrong, W.T.; Lipson, J.; Tuszewski, M. (Los Alamos Scientific Lab., NM (USA)). Feb 1981. Contract W-7405-ENG-36. 7p. NTIS, PC A02/MF A01.

An axial array of B/sub z/ probes is used to monitor the formation and initial motion of the x-point of the separatrix in a field-reversed configuration. The x-point is observed to form near the outside edge of the main coil at approximately 3.0 μs after main field initiation and then move rapidly toward the center of the coil.

16310 **(LA-tr—80-41) Intense source of very low energy deuterium atoms for heating plasmas for thermonuclear purposes.** Sermet, P. (Kanner (Leo) Associates, Redwood City, CA (USA)). 28 Mar 1978. Translation of Intense d'atomes de deuterium a tres basse energie en vue du chauffage de plasmas d'interet thermonucleaire. 168p. NTIS, PC A08/MF A01.

Thesis.

A cyclotron resonance ion source is described in some detail. A theoretical model of the source is also presented. Calculations were made of the marginal paths in a space charge regime in a magnetic field of revolution. (MOW)

16311 **(LA-UR—81-758) Performance optimization of a cusp-field ion source and high-perveance extractor.** Meyer, E.A.; Amstrong, D.D.; Schneider, D. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—30). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The injector for the Fusion Materials Irradiation Test (FMIT) Facility must deliver a 110-mA dc beam of deuterons or H_2^+ ions to the radio-frequency quadrupole (RFQ) accelerator at 75-keV energy. Operational parameters of a hydrogen-fed cusp-field ion source and a high-perveance extractor have been evaluated on a test stand and on the recently completed first stage of the prototype injector.

16312 **(LA-UR—81-759) FMIT direct-current beam monitor.** Brousseau, A.T.; Chamberlin, D.D. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 3p. (CONF-810314—29). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The prototype injector section for the Fusion Materials Irradiation Test (FMIT) Facility being developed at the Los Alamos National Laboratory requires that beam parameters be noninterceptively monitored. This report describes the application of a single toroidal core, coupled with very simple circuitry, that results in the production of a simple instrument, and eliminates the problems inherent in the Faraday cup technique for the current measurements of the FMIT injector beam.

16313 **(LA-UR—81-767) FMIT facility control system.** Suyama, R.M.; Machen, D.R.; Johnson, J.A. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—53). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The control system for the Fusion Materials Irradiation Test (FMIT) Facility, under construction at Richland, Washington, uses current techniques in distributed processing to achieve responsiveness, maintainability and reliability. Developmental experience with the system on the FMIT Prototype Accelerator (FPA) being designed at the Los Alamos National Laboratory is described as a function of the system's design goals and details. The functional requirements of the FMIT control system dictated the use of a highly operator-responsive, display-oriented structure, using state-of-the-art console devices for man-machine communications. Further, current technology has allowed the movement of device-dependent tasks into the area traditionally occupied by remote input-output equipment; the system's dual central process computers communicate with remote communications nodes containing microcomputers that are architecturally similar to the top-level machines. The system has been designed to take advantage of commercially available hardware and software.

16314 **(LA-UR—81-769) Noninterceptive transverse beam diagnostics.** Chamberlin, D.D.; Minerbo, G.N.; Teel, L.E. Jr.; Gilpatrick, J.D. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—25). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The transverse emittance properties of a high-current linear accelerator may be measured by using TV cameras sensitive to the visible radiation emitted following beam interactions with residual gas. This paper describes the TV system being used to measure emittances for the Fusion Materials Irradiation Test (FMIT) project.

16315 **(LA-UR—81-770) High-radiation-zone design of the FMIT high-energy beam transport.** Liska, D.J.; King, J.D.; Cole, T.R.; Cimabue, A.G.; Robeson, L.P.; Creek, K.O.; Harvey, A. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—26). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

The Fusion Materials Irradiation Test (FMIT) deuteron linac, operating at 35 MeV and 100 mA continuous duty, is expected to spill 3 μA/m and to lose 10 μA at specific bending-magnet positions. The major impact of this spill will be felt in the High-Energy Beam Transport (HEBT), where many beam-line components must be maintained. A modular design concept, that uses segmented termination panels remotely located from the modules, is being employed. Radiation-hardened quadrupoles can be opened, clamshell fashion, to release the water-cooled beam tube replacement if there is beam damage or lithium contamination from the target. Termination panels contain electrical, water, and instrumentation fittings to service the module, and are positioned to allow room for neutron-absorbing shielding between the beamline and the panel. The modular construction allows laboratory prealignment and check-out of all components on a structural carriage and is adaptable to supporting gamma shields.

16316 **(ORNL/TM—7584) Plateau diffusion coefficient for arbitrary flux surface geometry.** Meier, H.K.; Hirshman, S.P.; Sigmar, D.J.; Lao, L.L. (Oak Ridge National Lab., TN (USA)). Mar 1981. 39p. NTIS, PC A03/MF A01.

A relatively simple but accurate representation has been developed for magnetic flux surfaces; it is valid for finite β and it describes configurations with both ellipticity and D-shape. This repre-

sentation has been applied to the computation of the diffusion coefficient in the plateau regime.

16317 **(PPPL—1728) Neutral beam injector performance on the PLT and PDX tokamaks.** Schilling, G.; Ashcroft, D.L.; Eubank, H.P.; Grisham, L.R.; Kozub, T.A.; Kugel, H.W.; Rossmassler, J.; Williams, M.D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Feb 1981. Contract AM02-76CH03073. 24p. (CONF-800950—19). NTIS, PC A02/MF A01.

From 11. symposium on fusion technology; Oxford, UK (15 Sep 1980).

An overall injector system description is presented first, and this will be followed by a detailed discussion of those problems unique to multiple injector operation on the tokamaks, i.e., power transmission, conditioning, reliability, and failures.

16318 **(PPPL—1743) Active tokamak limiters; symmetrizing the edge plasma.** Motley, R.W. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Feb 1981. Contract AM02-76CH03073. 14p. NTIS, PC A02/MF A01.

The surface layers of tokamak plasmas are strongly unstable to low frequency oscillations. The limiter, by imposing a non-axisymmetric state in the plasma scrape-off layer, may be the source of the free energy driving the instabilities. An active, two-faced sandwich limiter is proposed to symmetrize the scrape-off layer, thereby minimizing the mismatch between the inner and outer tokamak states.

16319 **(PPPL—1747) Temporary fire sealing of penetrations on TFTR.** Hondorp, H.L. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Feb 1981. Contract AM02-76CH03073. 50p. NTIS, PC A03/MF A01.

The radiation shielding provided for TFTR for D-D and D-T operation will be penetrated by numerous electrical and mechanical services. Eventually, these penetrations will have to be sealed to provide the required fire resistance, tritium sealability, pressure integrity and radiation attenuation. For the initial hydrogen operation, however, fire sealing of the penetrations in the walls and floor is the primary concern. This report provides a discussion of the required and desirable properties of a temporary seal which can be used to seal these penetrations for the hydrogen operation and then subsequently be removed and replaced as required for the D-D and D-T operations. Several candidate designs are discussed and evaluated and recommendations are made for specific applications.

16320 **(SAND—81-0037C) Retention and release of hydrogen in graphite and related materials.** Doyle, B.L. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 8p. (CONF-801246—1). NTIS, PC A02/MF A01.

From First-wall in INTOR workshop; Willow Brook, IL, USA (18 Dec 1980).

We have recently studied the retention and release of hydrogen isotopes implanted into several low Z materials, including graphite, proposed for surfaces in TFTR subjected to high power deposition. The results of these experiments are summarized and the implications of these measurements are examined with respect to T buildup in the proposed graphite liner for INTOR.

16321 **(SAND—81-0445C) Light ion ignitors for inertial confinement fusion: progress toward proof-of-principle.** Quintenz, J.P.; Kuswa, G.W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 16p. (CONF-810326—1). NTIS, PC A02/MF A01.

From Jahrestagung Kerntechnik; Dusseldorf, F.R. Germany (24 Mar 1981).

From the inception of the REB effort, it was recognized that light ion beams offered substantial advantages as an ICF driver, and as the pulse power driver program progressed the possibilities of using light ion beams became increasingly evident. Because of the rapid progress made in the available power in these light ion beams, their superior target deposition characteristics, the fact that nonrelativistic ion beams can readily be bunched by a factor of 2 to 4, and the favorable scaling relations leading toward reactor levels, Sandia shifted its ICF emphasis from electrons to ions in 1979. The progress which has been made toward proof-of-principle using light ion ignitors, as well as the remaining problems, will be detailed in this paper.

16322 **(UCID—18985) Boiling liquid cauldron status report.** Hoffman, M.A. (Lawrence Livermore National Lab., CA (USA)). 28 Dec 1980. 25p. NTIS, PC A02/MF A01.

The progress made over the past year in assessing the feasibility of the high-temperature, boiling cauldron blanket concept for the tanden mirror reactor is reviewed. The status of the proposed experiments and recently revised estimates of the vapor void fraction in the boiling pool are discussed.

16323 **(UCRL—84684(Rev.1)) Laser irradiation of disk targets at 0.53 μm wavelength.** Mead, W.C.; Campbell, E.M.; Estabrook, K.G. (Lawrence Livermore National Lab., CA (USA)). 26 Jan 1981. Contract W-7405-ENG-48. 50p. (CONF-8009132—1(Rev.1); CONF-801119—3(Rev.1)). NTIS, PC A03/MF A01.

From 14. European conference on laser interaction with matter; Palaiseau, France (15 Sep 1980).

We present results and analysis for laser-irradiations of Be, CH, Ti, and Au disk targets with 0.53 μm light in 3 to 35 J, 600 ps pulses, at nominal intensities from 3×10^{13} to $\sim 4 \times 10^{15}$ W/cm^2. The measured absorptions are higher than observed in similar 1.06 μm irradiations, and are largely consistent with modeling which shows the importance of inverse bremsstrahlung and Brillouin scattering. Observed red-shifted back-reflected light shows that Brillouin is operating at low to moderate levels. The measured fluxes of multi-keV x-rays indicate low hot-electron fractions, with temperatures which are consistent with resonance absorption. Measurements show efficient conversion of absorbed light into sub-keV x-rays, with time-, angular-, and spatial-emission distributions which are generally consistent with non-LTE modeling using inhibited thermal electron transport.

16324 **(UCRL-Trans—1595) Design of pulsed heat-load-removal system for JT-60 neutral beam injector.** Araki, M.; Horiike, H.; Kuriyama, M.; Matsuda, S.; Morita, H.; Ohara, Y. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Mar 1981. Translation of JAERI-M—9198. 32p. NTIS, PC A03/MF A01.

In this design we have tested the removal system by taking into account the time required for the treatment of the pulsed heat load. From the results of this design we know that a heat removal system is possible with a cooling system design that is less than one-tenth the size of conventional designs. The details of this design are also applied to the prototype unit cooling system, which is a prototype of the JT-60 Neutral Beam Injector.

16325 **Fast-acting valve and uses thereof.** Meyer, J.A. (to Dept. of Energy). US Patent Application 150,393. 16 May 1980. 19p.

A very fast acting valve capable of producing a very well-defined plug of gas suitable for filling a theta pinch vacuum vessel is given. The valve requires no springs, instead being stopped mainly by a nonlinear force. Thus, the valve is not subject to bouncing; and the ratio of the size of the valve housing to the size of the valve stem is smaller than it would be if springs were needed to stop the valve stem. Furthermore, the valve can be used for thousands of valve firings with no apparent valve damage.

16326 **Alignment accuracy at the Helios CO_2 laser.** Liberman, I.; Benjamin, R.F. (Los Alamos Scientific Lab., NM). *SPIE (Society of Photo-Optical Instrumentation Engineers) Seminar Proceedings ;* **179**: 67-74(1979).

The accuracy with which beams from the LASL eight-beam CO_2 laser, Helios, can be centered onto a fusion target has been measured. The average pointing error of 34 μm is adequate for initial high-power experiments. The technique is rapid and accurately simulates the conditions of actual target experiments.

99 GENERAL AND MISCELLANEOUS

9901 Management

16327 (ORAU—177) Summer Science Student Program: a replication manual. (Oak Ridge Associated Universities, Inc., TN (USA)). Jan 1981. Contract AC05-76OR00033. 63p. NTIS, PC A04/MF A01.

The Summer Science Student Program (SSSP) combines basic skill enrichment (in science, math, and communications), career motivation, and energy awareness to encourage economically disadvantaged and academically talented youth to complete high school and pursue energy-related careers. The program is designed to enrich the academic experiences of the youth while they are in high school and to increase their awareness of energy issues and career opportunities in energy technology. Ultimately, SSSP helps to prepare these youth to enter postsecondary education or skill training leading to technical, paraprofessional, and professional energy-related careers. The purpose of this manual is to provide DOE contractors, private industry, prime sponsors, and community-based organizations with information that can be used in SSSP replication and continuation efforts. Some of the challenges met in the programs's initial implementation are reviewed, and a step-by-step procedure for establishing new SSSP sites is described. 9 figures. (RWR)

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 15256, 16103, 16341

16328 (CONF-7904163—1) Towards automatic synthesis of linear algebra programs. Boyle, J.M. (Argonne National Lab., IL (USA)). 1979. Contract W-31-109-ENG-38. 25p. NTIS, PC A02/MF A01.

From Conference on the production and assessment of numerical software; Liverpool, UK (9 Apr 1979).

Automating the writing of efficient computer programs from an abstract specification of the computation that they are to perform is discussed. Advantages offered by automatic synthesis of programs include economy, reliability, and improved service. The synthesis of simple linear algebra programs is considered in general and then illustrated for the usual matrix product, a column-oriented matrix product, a rank-one update matrix product, and a program to multiply three matrices. The accumulation of inner products and transformational implementation of program synthesis addressed. The discussion attempts to illustrate both the general strategy of the syntheses and how various tactics can be adapted to make the syntheses proceed deterministically to programs that are optimal with respect to certain criteria. (RWR)

16329 (DOE/ER/10667—1) Studies of the applicability of optoelectronics devices for instrumentation in high energy physics. Proposed program. (Pittsburgh Univ., PA (USA)). 1981. Contract AC02-80ER10667. 16p. NTIS, PC A02/MF A01.

Work performed to understand the techniques of optical data processing and the development of tools for carrying out laboratory experiments in this area are discussed. Ideas about how an incoherent optical correlator can be developed for use as a trigger processor have been developed. (GHT)

16330 (LA-UR—81-488) Nonlinear semigroup theory for systems. Pimbley, G.H. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 15p. (CONF-810128—1). NTIS, PC A02/MF A01.

From Research conference; Pomona, CA, USA (10 Jan 1981).

The abstract Cauchy problem in a B-space is considered. Under certain conditions, and with use of the Generation Theorem of Crandall and Liggett [Am. J. Math., 93, 265-298 (1971)], the finite difference problem has a unique solution on [0,infinity]. The author works here to extend the application of the Crandall-Liggett theorem to two conservation laws with linear coupling. (RWR)

16331 (LBL—11452) Encouraging mature user behavior. Stevens, D.F. (Lawrence Berkeley Lab., CA (USA)). Sep 1980. Contract W-7405-ENG-48. 15p. (CONF-810501—2). NTIS, PC A02/MF A01.

From National computer conference; Chicago, IL, USA (May 1981).

Mature user behavior is defined, and five specific DP Department policies that will encourage such behavior on the part of the users are considered.

16332 (ORNL—5689) TERPED: a versatile code for examining the distribution of experimental data. Fields, D.E. (Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 71p. NTIS, PC A04/MF A01.

TERPED is a computer code designed to facilitate the quantitative analysis of experimental data and to determine the data's frequency distribution. This code differs from its predecessor, TEDPED, primarily in two respects: First, TERPED performs many bookkeeping functions that were left to the user in the predecessor, resulting in less restricitve user prompts. Second, plots may be either displayed on a local graphics terminal or relayed to a remote device. Thus, the user may use TERPED to analyze data and generate a compressed plot data set, then choose to preview the plot locally and/or route the compressed data set to a remote FR-80 35-mm film plotter or a Calcomp plotter for high quality graphical output. The code produces graphical and numerical descriptions of a set of input data based upon the user's assumption of either a normal or lognormal distribution. Options include calculations of the chi-squared statistic, the Kolmogorov-Smirnov nonparametric statistic, and Pearson's correlation coefficient. The plots produced are of the linearized cumulative-probability data distribution. Data may be by named data file or via the user's terminal keyboard. The code is written in FORTRAN and runs on a Digital Equipment Corporation PDP-10 computer; typical central-processor-unit execution time is about 0.32 s, exclusive of plotting time. The code size is about 1300 card images.

16333 (SAND—80-2548) CDC/1000: a Control Data Corporation remote batch terminal emulator for Hewlett-Packard minicomputers. Berg, D.E. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 377p. NTIS, PC A17/MF A01.

The Control Data Corporation Type 200 User Terminal utilizes a unique communications protocol to provide users with batch mode remote terminal access to Control Data computers. CDC/1000 is a software subsystem that implements this protocol on Hewlett-Packard minicomputers running the Real Time Executive III, IV, or IVB operating systems. This report provides brief descriptions of the various software modules comprising CDC/1000, and contains detailed instructions for integrating CDC/1000 into the Hewlett Packard operating system and for operating UTERM, the user interface program for CDC/1000. 6 figures.

16334 (SU—326-P30-68) Numerical analysis. Progress report, 1 November 1979-31 October 1982. Golub, G.H. (Stanford Univ., CA (USA). Dept. of Computer Science). Sep 1979. Contract AT03-76ER71030. 33p. NTIS, PC A03/MF A01.

Research in applied mathematics and numerical analysis is reported. Work in the following areas is included: inverse eigenvalue problems and Gaussian quadrature; numerical solution of two-point boundary-value problems (theory and applications); projected Lagrangian algorithms for nonlinear minimax and l_1 optimization; total least-squares estimation; least-squares tensor product spline fitting; fast biharmonic solver; extensions and uses of the variable projection algorithm for solving nonlinear least-squares problems; and three problems in numerical linear algebra. Administrative information (lists of personnel, papers, etc.) is also given. (RWR)

16335 (SU—326-P.39-31) Theory of interpretive architectures: ideal language machines. Technical report No. 170. Flynn, M.J.; Hoevel, L.W. (Stanford Univ., CA (USA). Computer Systems Lab.). Feb 1979. Contract AT03-76ER70039. 60p. (SU-SEL—79-011). NTIS, PC A04/MF A01.

A study in ideal computer architectures or program representations is presented. An ideal architecture can be defined with

respect to the representation that was used to describe a program originally, i.e., the higher-level language. Traditional machine architectures name operations and objects presumed to be present in the host machine: a memory space of certain size, ALU operations, etc. An ideal machine framed about a specific higher-level language assumes operations present in that language, and uses these operations to describe relationships between objects described in the source representation. The notion of ideal is carefully constrained. The object program representation must be easily decompilable (i.e. the source is readily reconstructable). It is simply assumed that the source itself is a good representation for the original problem; thus, any nonassignment operation present in the source program statement will appear as a single instruction (operation) in the ideal representation. All named objects are defined with respect to the natural scope of definition of the source program. For simplicity of discussion, statistical behavior of the program or the language is assumed to be unknown; i.e. Huffman codes are not used. A canonic interpretive form (CIF) or measure of a higher-level language program is developed. CIF measures both static space to represent the program and dynamic time measurements of the number of instructions to be interpreted and the number of memory references these instructions will require. The CIF or ideal program representation is then compared by use of the Whetstone benchmark in its characteristics to several contemporary architectural approaches: IBM 370, Honeywell Level 66, Burroughs S-Language FORTRAN and DELtran, a quasi-ideal FORTRAN architecture based on CIF principles. 7 figures, 10 tables.

16336 **(SU—326-P3069) Equidistributing meshes with constraints.** Kautsky, J.; Nichols, N.K. (Stanford Univ., CA (USA). Dept. of Computer Science). Sep 1979. Contract AT03-76ER71030. 38p. (STAN-CS—79-766). NTIS, PC A03/MF A01.

Adaptive methods for selecting meshes that equi-distribute a given positive weight function are now used fairly widely in solving boundary-value problems. The disadvantage of such schemes is that the resulting mesh may not be smoothly varying, and the lack of smooth variation adversely affects accuracy and convergence properties. An adaptive technique is developed for equidistributing a function subject to constraints on the ratios of adjacent steps in the mesh. A theoretical analysis of the procedure is presented, and numerical algorithms for implementing the method are given. Applications show that the procedure is effective in practice. Other types of constraints on equidistributing meshes are also discussed. 2 figures, 9 tables.

16337 **(UCRL—85225) Digital image processing software system using an array processor.** Sherwood, R.J.; Portnoff, M.R.; Journeay, C.H.; Twogood, R.E. (Lawrence Livermore National Lab., CA (USA)). 10 Mar 1981. Contract W-7405-ENG-48. 12p. (CONF-810424—2). NTIS, PC A02/MF A01.

From ARRAY user's annual conference; St Louis, MO, USA (26 Apr 1981).

A versatile array processor-based system for general-purpose image processing was developed. At the heart of this system is an extensive, flexible software package that incorporates the array processor for effective interactive image processing. The software system is described in detail, and its application to a diverse set of applications at LLNL is briefly discussed. 4 figures, 1 table.

16338 **(UCRL—85562) Managing domains in a network operating system.** Donnelley, J.E. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 18p. (CONF-810515—1). NTIS, PC A02/MF A01.

From International conference on local networks and distributed systems; London, UK (11 May 1981).

The needs for economy, reliability, security, and privacy in distributed information systems have suggested that such systems be constructed from modules operating in separate domains. Ideally, the domain of each module would permit access to only those resources needed to accomplish its task. In practice, it has proved difficult to provide such precise access control. At the level of process-to-process communication there is the thorny problem of defining a resource-independent protocol for communicating resource access (capabilities). Several approaches to this problem are discussed, including a solution based on public key encryption. At the level of human-to-process communication there is a similar problem of communicating access to resources. Here a person at a terminal needs to be able to indicate which resources should be made available to the processes performing a requested task. The advantages of a discriminating domain control at the process level are largely wasted if the human-to-process protocols fail to address this important issue. 6 figures, 1 table.

16339 **Efficient Fortran subprograms for the solution of separable elliptic partial differential equations.** Swarztrauber, P.N.; Sweet, R.A. (Los Alamos Scientific Lab., NM). *ACM Transactions on Mathematical Software ;* **5**: No. 3, 365-371(Sep 1979).

The problem of computing solutions to modified Helmholtz equations (or, more generally, separable linear elliptic equations) with simple boundary conditions on a rectangle in any of several coordinate frames arises frequently in applications and as an intermediate step in the solution of nonlinear and evolution problems. The developing, documenting, and testing of a package for this task is described. 2 tables. (RWR)

16340 **PDECOL, general collocation software for partial differential equations.** Madsen, N.K. (Univ. of California, Livermore); Sincovec, R.F. *ACM Transactions on Mathematical Software ;* **5**: No. 3, 326-351(Sep 1979).

PDECOL, new computer software package for numerically solving coupled systems of nonlinear partial differential equations (PDE's) in one space and one time dimension, is discussed. The package implements finite element collocation methods based on piecewise polynomials for the spatial discretization techniques. The time integration process is then accomplished by widely acceptable procedures that are generalizations of the usual methods for treating time-dependent partial differental equations. PDECOL is unique because of its flexibiility both in the class of problems it addresses and in the variety of methods it provides for use in the solution process. High-order methods (as well as low-order ones) are readily available for use in both the spatial and time discretization procedures. The time integration methods used feature automatic time step size and integration formula order selection so as to solve efficiently the problem at hand and yet achieve a user-specific time integration error level. PDECOL consists of a collection of 19 subroutines written in reasonably standard Fortran, and therefore is quite portable. No special hardware features are required. PDECOL is designed to solve broad classes of difficult systems of partial differential equations that descrobe physical processes. 4 figures, 1 table. (RWR)

9903 Information Handling

16341 **(CONF-810322—1) Videodisc technology.** Marsh, F.E. Jr. (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Mar 1981. 28p. NTIS, PC A03/MF A01.

From 6. annual conference of the East Tennessee Chapter of the Association of Records Managers and Administrators, Inc.; Knoxville, TN, USA (26 Mar 1981).

An overview of the technology of videodiscs is given. The emphasis is on systems that use reflection or transmission of laser light. Possible use of videodiscs for storage of bibliographic information is considered. 6 figures, 3 tables. (RWR)

16342 **(DOE/TIC—4500(Rev.69)) Standard distribution for unclassified scientific and technical reports: instructions and category scope notes.** (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Dec 1980. 27p. NTIS, PC A03/MF A01.

The US Department of Energy Technical Information Center (DOE/TIC) uses a subject category scheme for classifying and distributing DOE-originated or -sponsored unclassified scientific and technical reports. This document contains the subject category scope notes used for these purposes. Originators of DOE or DOE-sponsored scientific and technical reports are urged to adhere to the instructions contained this publication. A limited number of copies of the unabridged version (addresses included) are available to Department of Energy offices and their contractors as DOE/TIC-4500(Rev.69)(Unabridged). (RWR)

9905 Civilian Defense

16343 **(AD-A—088373) Adequacy of wind ventilation in upgraded shelters. Final report.** Henninger, R.; Krishnakumar, C.; Tsal, R. (GARD, Inc., Niles, IL (USA)). Jun 1980. Contract DCPA01-78-C-0319. 11p. NTIS, PC A02/MF A01.

The objective of this study was to assess the adequacy of natural ventilation for application to upgrade shelters; i.e., shelters having full earth berms with at least 6 inches of earth overhead. It was realized that the wind induced ventilation air flow rate through a building is a complex function of several geometric and flow variables. Important among these variables are wind speed, wind direction, boundary layer profile of the approaching wind, building geometry, areas and locations of windows and doors, internal obstacles within the building, and the nature and proximity of neighboring buildings and obstructions. Data acquisition from experiments of full size buildings was considered expensive and time consuming. The approach taken therefore, was to conduct controlled tests on properly designed scaled model systems. A series of tests were designed to yield a clear understanding of the effects of the important variables individually, and in groups, on the ventilation airflow rates. The building geometry was kept relatively simple and internal flow resistances were excluded. Natural ventilation due to thermal effects were also ignored since the shelters were considered to be one story high.

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In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the report title and the volume and abstract numbers. Report numbers, if applicable, are given in parentheses at the end of the entry.

DOE Energy Information Data Base: Corporate Author Entries (TID-4585) is used in the standardization of corporate entries. TID-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

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Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.
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Soot formation in synfuels. First quarterly report, 19 September-31 December 1980, 6:15429 (DOE/PC/30304—1)

AiResearch Mfg. Co., Phoenix, AZ (USA)
Advanced combustion systems for stationary gas turbine engines. Volume IV. Combustor verification testing. Addendum. Final report Jul-Oct 79, 6:15976 (PB—80-179849)

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Arizona Univ., Tucson (USA). Dept. of Geosciences
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Armco, Inc., Middletown, OH (USA)
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Army Missile Command, Redstone Arsenal, AL (USA). Directed Energy Directorate
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Arnold Engineering Development Center, Arnold Air Force Station, TN (USA)
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Aspen Inst. for Humanistic Studies, Boulder, CO (USA)
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Avco-Everett Research Lab., Everett, MA (USA)
Visible laser research one meter device. Interim report 1 Jul 79-28 Feb 80, 6:15950 (AD-A—084196)

B

Babcock and Wilcox Co., Alliance, OH (USA). Research and Development Div.
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Battelle Columbus Labs., OH (USA)
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Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)
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Preparation and photoelectronic properties of the system Cd_2Ge/sub 1-x/Si/sub x/O_4. Technical report, 6:15846 (AD-A—084199)

Brown Univ., Providence, RI (USA). Div. of Applied Mathematics
Finite element methods for heat transfer problems. Final report 15 Jun 76-15 Sep 79, 6:15957 (AD-A—084450)

Bundesministerium fuer Forschung und Technologie, Bonn-Bad Godesberg (Germany, F.R.)
Gross properties of nuclei and nuclear excitations. Proceedings, 6:16267 (INIS-mf—6088)
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Bureau of Mines, Tuscaloosa, AL (USA). Tuscaloosa Research Center
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California Inst. of Tech., Pasadena (USA). Div. of Chemistry and Chemical Engineering
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California Inst. of Tech., Pasadena (USA). Div. of Geological and Planetary Sciences
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Chicago Univ., IL (USA). Enrico Fermi Inst.
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City Coll., New York (USA). Dept. of Physics
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Clark Univ., Worcester, MA (USA)
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Colorado Geological Survey, Denver (USA)
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Colorado State Univ., Fort Collins (USA). Fluid Mechanics and Diffusion Lab.
Dispersion of vapor from LNG spills: simulation in a meteorological wind tunnel of spills at China Lake Naval Weapons Center, California. Final report, 6:15318 (AD-A—084339)

Combustion Engineering, Inc., Windsor, CT (USA). Power Systems Group
Industrial application of C-E's coal-gasification process. Final report, January 1979-August 1980, 6:15194 (FE—1545-86)

Cornell Univ., Ithaca, NY (USA)
Pyrolysis of coal-derived fuels using the laser-powered homogeneous pyrolysis technique. Technical progress report, 6:15193 (DOE/PC/30217—T1)

Cornell Univ., Ithaca, NY (USA). School of Applied and Engineering Physics
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Delaware Univ., Newark (USA). Dept. of Chemical Engineering
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Department of Energy, Oak Ridge, TN (USA). Technical Information Center
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Selected characteristics of the US oil and gas producing industry: a 1977 reserves report supplement, 6:15290 (DOE/EIA—0268(77))

Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs
Cobalt-chromium alloy castings, 6:15831 (NE-M—4-3T(Rev.)(1-81))
Helical age-hardenable nickel-chromium-iron alloy springs, 6:15830 (NE-M—8-1T(Rev.)(1-81))
Nuclear standard: 2 1/4%-chromium, 1%-molybdenum alloy steel seamless tubes (ASME SA-213 with additional requirements), 6:15673 (NE-M—3-33T(Rev.)(1-81))
Quality verification program requirements, 6:15674 (NE-F—2-4(L)(Amend.)(1-81))

Department of Housing and Urban Development, Washington, DC (USA)
Solar project description for Summerwood Associates' condominium residences (G), Old Saybrook, Connecticut, 6:15505 (SOLAR/1081—80/50)

Dornier-System G.m.b.H., Friedrichshafen (Germany, F.R.)
High performance collector for small solar energy installations. Final report, 6:15508 (EUR—6799-DE)

Drexel Univ., Philadelphia, PA (USA). Dept. of Chemistry
Physical and chemical studies of chlorophyll in microemulsions. Progress report, 6:15444 (DOE/ER/04452—3)

Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.
Boston 1° x 2° NTMS area, Massachusetts and New Hampshire. Supplemental data report: National Uranium Resource Evaluation program, hydrogeochemical and stream sediment reconnaissance, 6:15347 (GJBX—72(81))
Glens Falls 1° x 2° NTMS area, New Hampshire, New York, and Vermont. Supplemental data report: National Uranium Resource Evaluation program, hydrogeochemical and stream sediment reconnaissance, 6:15345 (GJBX—70(81))
Newark 1° x 2° NTMS area, New Jersey, New York, and Pennsylvania. Supplemental data report: National Uranium Resource Evaluation program, hydrogeochemical and stream sediment reconnaissance, 6:15346 (GJBX—71(81))
Oxidation of molecular tritium by intact soils, 6:16101 (DP-MS—80-106)
Roanoke 1° x 2° NTMS area, Virginia. Data report (abbreviated): National Uranium Resource Evaluation program, hydrogeochemical and stream sediment reconnaissance, 6:15348 (GJBX—73(81))

Dwyer-Mercer County District Public Library, Celina, OH (USA)
Solar passive ceiling system. Final report, 6:15495 (DOE/R5/10148—2)

Dynamics Technology, Inc., Torrance, CA (USA)
Feasibility study of applying laminar flow control to an lta vehicle. Final report, 6:16252 (AD-A—088148)

E

Eaton Industries of Houston, Inc., TX (USA)
Testing geopressured geothermal reservoirs in existing wells. Annual report, 6:15571 (DOE/ET/27081—2)

ECON, Inc., Princeton, NJ (USA)
Methods of economic analysis applied to fusion research. Fourth annual report, 6:16308 (DOE/ET/52017—4)

EG and G Idaho, Inc., Idaho Falls (USA)
Analyses of mixed-hydrocarbon binary thermodynamic cycles for moderate-temperature geothermal resources, 6:15569 (EGG-PG-G—80-041)
Hydrothermal energy development projects, 6:15580 (CONF-810315—7)
PBF experimental program, 6:15689 (CONF-791118—12)
Propane conversion in the vehicle fleet at the Idaho National Engineering Laboratory, 6:15809 (EGG-TRAN—5291)

EG and G, Inc., Albuquerque, NM (USA)
Drag devices for two-phase mass flow measurements, 6:15671 (NUREG/CR—1361)
Independent assessment of the steady state fuel rod analysis code FRAPCON-1, 6:15680 (NUREG/CR—1339)
Quarterly technical progress report on water reactor safety programs sponsored by the Nuclear Regulatory Commission's Division of Reactor Safety Research, January-March 1980, 6:15695 (NUREG/CR—1400)
Test PCM-5 fuel rod materials behavior, 6:15696 (NUREG/CR—1430)

EIC, Inc., Newton, MA (USA)
Development of photoelectrochemical cells based on compound semiconductors and nonaqueous electrolyes. Quarterly technical progress report, August 1, 1980-October 31, 1980, 6:15459 (SERI/PR—8002-7-T1)
Elmhurst Coll., IL (USA). Dept. of Physics
Search for narrow resonances in $pp \rightarrow p\pi^+ n$ at 2 GeV/c, 6:16259 (ANL-HEP-CP—80-26)
Energy and Minerals Research Co., Exton, PA (USA)
Efficient ultrasonic grinding: a new technology for micron-sized coal. Quarterly technical progress report No. 3, March 16, 1980-June 15, 1980, 6:15264 (DOE/ER/10466—T2)
Efficient ultrasonic grinding: a new technology for micron-sized coal. Quarterly technical progress report No. 1, September 15-December 15, 1979, 6:15266 (DOE/ER/10466—T4)
Efficient ultrasonic grinding: a new technology for micron-sized coal. Quarterly technical progress report No. 2, December 16, 1979-March 15, 1980, 6:15265 (DOE/ER/10466—T3)
Energy Conversion Devices, Inc., Troy, MI (USA)
CVD ZrB_2 as a selective solar absorber, 6:15550 (SAND—81-2176C)
Energy Research Corp., Danbury, CT (USA)
Evaluation of distributed gas cooling of pressurized PAFC for utility power generation. Technical progress report No. 4, August-November 1980 (quarterly), 6:15764 (DOE/ET/13114—T6)
Enviro Control, Inc., Rockville, MD (USA)
Study to modify the vulnerability model of the risk management system. Final report, 6:16123 (AD-A—084214)
Envirodyne Ltd., Waterloo, Ontario (Canada)
Investigation of numerical modeling techniques for recirculating flows: Parts 1 and 2. Final report, February 1981, 6:15617 (EPRI-CS—1665)
Environmental Protection Agency, Las Vegas, NV (USA). Environmental Monitoring Systems Lab.
Lead particles in the Great Smoky Mountains biosphere reserve. Interim report, 6:16105 (PB—80-170004)
Environmental Protection Agency, Leonardo, NJ (USA). Ohmsett Test Facility
Performance tests of high speed ZRV oil skimmer. Final report 8 Sep-13 Oct 79, 6:16114 (AD-A—088062)
Environmental Protection Agency, Rockville, MD (USA)
Evaluation of XRG Number 1: a fuel additive. Technical report, 6:15810 (PB—80-180672)
Exoil Services, Golden, CO (USA)
Experimental evaluation of reservoir pretreatment in chemical flooding. Final report, 6:15280 (DOE/BC/10027—12)
Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)
Development of submicron particle size classification and collection techniques for nuclear facility off-gas streams, 6:15367 (ENICO—1076)
Exxon Research and Engineering Co., Florham Park, NJ (USA). Engineering Technology Dept.
Industrial application fluidized bed combustion: Category III. Indirect fired heaters. Quarterly technical report No. 16, April 1-June 30, 1980, 6:15270 (DOE/ET/10379—T4)
Exxon Research and Engineering Co., Linden, NJ (USA)
Fundamental synthetic fuel stability study. First annual report, May 1, 1979-April 30, 1981, 6:15229 (DOE/BC/10045—12)

F

Fan Systems Co., Sun City West, AZ (USA)
Failure cause analysis: fans. Final report, 6:15618 (EPRI-CS—1693)
Faucett (Jack) Associates, Inc., Chevy Chase, MD (USA)
Analysis of the permitting processes associated with exploration of Federal OCS leases. Final report. Volume II. Appendices, 6:15296 (DOE/RA/35012—1(Vol.2))
Analysis of the premitting processes associated with exploration of Federal OCS leases. Final report, 6:15295 (DOE/RA/35012—1(Vol.1))
Federal Aviation Administration, Washington, DC (USA). Office of Environment and Energy
National Aviation Fuel Scenario Analysis Program (NAFSAP). Volume I. Model description. Volume II. User manual. Final report, 6:15778 (AD-A—084235)
Ferschl (Michael S.), Milwaukee, WI (USA)
Electric moped, 6:15804 (DOE/R5/10157—2)
Fiorello, Shaw and Associates, Vienna, VA (USA)
Bibliography of studies dealing with incentives and their impacts on energy development. Fianl report, 6:15724 (DOE/EI/11973—T1)
Flow Research Co., South Kent, WA (USA)
Advanced electrode design for electrostatic precipitators, 6:15977 (DOE/EV/10506—T1)
Foersvarets Forskningsanstalt, Stockholm (Sweden)
Seismological recordings of nuclear explosions in 1976 obtained at the Hagfors Observatory in Sweden, 6:16054 (FOA-C—20275-T1)
Foreign Technology Div., Wright-Patterson AFB, OH (USA)
Electrical equipment for electric power stations and substations (selected chapters), 6:15599 (AD-A—084531)
Foundation Sciences, Inc., Portland, OR (USA)
Thermal/mechanical properties of Pomona member basalt: full-scale heater test No. 2 (area 2), 6:15372 (RHO-BWI-C—85)

G

GARD, Inc., Niles, IL (USA)
Adequacy of wind ventilation in upgraded shelters. Final report, 6:16343 (AD-A—088373)
Gas-Cooled Reactor Associates, La Jolla, CA (USA)
High-temperature gas-cooled reactor steam cycle/cogeneration application study, 6:15647 (DOE/SF/02034—T12)
General Accounting Office, Washington, DC (USA)
Three Mile Island: the financial fallout, 6:15727 (EMD—80-89)
General Atomic Co., San Diego, CA (USA)
Effects of a range of machined and ground surface finishes on the simulated reactor helium corrosion of several candidate structural materials, 6:15817 (GA-A—15674)
General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.
Advanced cleanup device performance design report (Task 4.3). Volume A. Cyclone theory and data correlation, 6:15632 (FE—2357-70(Vol.A))
PFB coal-fired combined-cycle development program. Test evaluation report: CURL test series, 6:15621 (FE—2357-69)
General Electric Co., Schenectady, NY (USA). Gas Turbine Div.
High-reliability gas turbine Combined-Cycle Development Program: Phase I. Summary, 6:15614 (EPRI-AP—1681-SU)
High-reliability gas turbine combined-cycle development program. Phase I. Final report, 6:15615 (EPRI-AP—1681(Vol.2))
High-Temperature Combustion Gas Turbine Program, 6:15622 (NYSERDA—80-12)
High-temperature turbine technology program turbine simulator tests with coal-derived low-Btu gas fuel, 6:15620 (FE—1806-92)
General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.
Environmental monitoring report, 1980: Pinellas Plant, 6:16075 (GEPP-EM—570)
Study of elastomer filler/ceramic delamination in neutron tubes, 6:15419 (GEPP-TIS—554)
Geodata International, Inc., Dallas, TX (USA)
Aerial radiometric and magnetic survey: Kalispell National Topographic Map, Montana Rockies wrap-up Project. Final report, 6:15350 (GJBX—76(81))
Aerial radiometric and magnetic survey: Preston National Topographic Map, Idaho/Wyoming Rockies wrap-up Project. Final report, 6:15349 (GJBX—74(81))
Georgia Inst. of Tech., Atlanta (USA). School of Nuclear Engineering
International aspects of fusion, 6:16293 (DOE/ET/52049—12)
Georgia Power Co., Atlanta (USA)
Solar total energy: large scale experiment, Shenandoah, Georgia Site. Annual report, June 1978-June 1979, 6:15477 (DOE/ET/20216—4)

Georgia Univ., Athens (USA). Dept. of Physics
High-energy hadron-hadron collisions. Annual progress report, 6:16256 (DOE/ER/00946—T1)
Gordian Associates, Inc., New York (USA)
IEA Energy conservation in the iron and steel industry, 6:15781 (DOE/CS/40300—T2)
Grumman Aerospace Corp., Bethpage, NY (USA). Research Dept.
Electrochemical photovoltaic cells CdSe thin film electrodes. Final report, June 1979-June 1980, 6:15465 (SERI/TR—8002-8-T1)

H

Hanford Engineering Development Lab., Richland, WA (USA)
Experience in startup and operation of fast flux facility, 6:15681 (HEDL-SA—2214)
Process for controlling accidents in chemical laboratories, 6:16230 (HEDL-SA—2248)
Stability of γ' and γ'' in inconel 706 under neutron irradiation, 6:15818 (HEDL-SA—2161)
Harvard Univ., Cambridge, MA (USA). Div. of Applied Sciences
Percolation and electrical conduction in superconducting composites. Interim report, 6:15928 (AD-A—088196)
Harvard Univ., Cambridge, MA (USA). John Fitzgerald Kennedy School of Government
Qualitative assessment of the residential-building-construction market and its implications for the Building Energy Performance Standards program, 6:15769 (DOE/PE/70278—T13)
Hawaii Univ., Manoa (USA). Hawaii Natural Energy Inst.
Preliminary assessment of solar salinity-gradient ponds applications in Hawaii, 6:15509 (HNEI—80-08)
Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry
Vib-rotational energy transfer and relaxation patterns in non-equilibrium chemical systems. Final report 15 Sep 77-14 Sep 79, 6:15949 (AD-A—084132)
Hughes Research Labs., Malibu, CA (USA)
Indium phosphide/cadmium sulfide thin-film solar cells. Quarterly report, July-October 1980, 6:15462 (SERI/PR—9196-1-T1)

I

ICF, Inc., Washington, DC (USA)
Coal resource information. Volume 1. Coal resource information requirements. Final report, 6:15250 (EPRI-EA—673(Vol.1))
Coal resource information. Volume 2, part 1: reviews of major resource studies and ongoing research. Final report, 6:15251 (EPRI-EA—673(Vol.2)(Pt.1))
Idaho National Engineering Lab., Idaho Falls (USA)
Effect of four simulated coal gasifier atmospheres on the biaxial stress rupture behavior of four candidate coal gasifier alloys, 6:15182 (CONF-8010162—1)
Illinois Inst. of Tech., Chicago (USA)
Diffusion mechanisms and degradation of environmentally sensitive composite materials. Progress report, July 1, 1980-June 30, 1981, 6:15842 (COO—444-9)
Method of vibrational control in the problem of stabilization of chemical reactors. Progress report, July 1, 1980-June 30, 1981, 6:15929 (DOE/ER/10709—1)
Illinois State Water Survey, Urbana (USA)
Acidic precipitation: considerations for an air-quality standard, 6:16064 (BNL—29031)
Illinois Univ., Urbana (USA)
Correlated BCS theory, 6:16290 (DOE/ER/01198—1341)
Illinois Univ., Urbana (USA). Dept. of Civil Engineering
Treatment of coal-conversion wastewater with the powdered activated carbon-contact stabilization activated-sludge process. First semiannual technical progress report, August 1, 1980-January 31, 1981, 6:15240 (DOE/PC/30233—T1)
Indiana Geological Survey, Bloomington (USA)
Stratigraphic cross sections showing the Sunbury, Ellsworth, and Antrim shales (Devonian and Mississippian) in northern Indiana, 6:15304 (METC/EGSP—817)
Institute of Gas Technology, Chicago, IL (USA)
Coal gasification pilot plant support studies. Quarterly report, October 1-December 31, 1979, 6:15199 (FE—2806-7)
Coal gasification pilot plant support studies. Subtask 1-1. Effects of process variables on the initial gasification reactions of noncaking coals. Topical report, April 1978-April 1980, 6:15200 (FE—2806-8)
Coal gasification pilot plant support studies: summary report. Final report, April 1, 1978-April 30, 1980, 6:15203 (FE—2809-19)
Environmental assessment of the HYGAS process. Volume III. Interim report on HYGAS environmental characterization: manual of methods for characterization of HYGAS pilot plant solids, liquids, and gases, 6:15850 (FE—2433-26)
Pipeline gas from coal - hydrogenation (IGT hydrogasification process). Quarterly report No. 15, January 1-March 31, 1980, 6:15197 (FE—2434-62)
Research and development of rapid hydrogenation for coal conversion to synthetic motor fuels (riser cracking of coal). Final report, April 1, 1976-September 30, 1980, 6:15186 (DOE/ET/10520—1)
Synthetic fuels from US oil shales: a technical and economic verification of the Hytort Process. Annual report, October 1, 1979-September 30, 1980, 6:15329 (DOE/ET/14102—T1)
Instituto de Ceramica y Vidrio, Madrid (Spain)
Influence of grain boundary silica impurity on alumina toughness, 6:15840 (LBL—12190)
International Nickel Co., Inc., Suffern, NY (USA). INCO Research and Development Center
Weld overlaying for corrosion resistance in coal-gasification atmospheres. Final report, August 15, 1977-August 15, 1979, 6:15198 (FE—2621-15)
IRECO Chemicals, Salt Lake City, UT (USA)
Alternative oxidizers for strip coal mine blasting agents, 6:15255 (DOE/ET/13347—1)

J

JAYCOR, Del Mar, CA (USA)
Evaluation of instrumentation. Final report 3 Oct 77-2 Oct 78, 6:16046 (AD-A—084649)
Jet Propulsion Lab., Pasadena, CA (USA)
Block V solar cell module: design and test specification for intermediate-load applications, 1981, 6:15472 (DOE/CS/31037—T1)
Cost/performance of solar reflective surfaces for parabolic dish concentrators, 6:15507 (DOE/JPL—1060-40)
Parabolic-dish concentrator designs and concepts, 6:15510 (JPL—400-98)
Progress Report 16 for the period April-September 1980, and the proceedings of the 16th Project Integration Meeting, 6:15447 (DOE/JPL—1012-51)
J. G. M. Associates, Palo Alto, CA (USA)
Testing of aluminum stainless steel bonds for long-term storage, 6:15829 (UCRL—84412)
Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.
Energy programs. Quarterly report, January-March 1980, 6:15432 (JHU/APL-EQR—80-1)
Vacuum-deposited polycrystalline silicon films for solar-cell applications. Final technical report, September 14, 1979-December 1, 1980, 6:15467 (SERI/TR—8278-1-T4)

K

Kaman Avidyne, Burlington, MA (USA)
Further evaluation of blast tests of an engine inlet. Final report 1 Apr 78-31 Mar 79, 6:16050 (AD-A—088511)

Kanner (Leo) Associates, Redwood City, CA (USA)
Intense source of very low energy deuterium atoms for heating plasmas for thermonuclear purposes, 6:16310 (LA-tr—80-41)
Kentucky Geological Survey, Lexington (USA)
East-West cross sections, north and south of Rough Creek fault system, 6:15305 (METC/EGSP—900)
Isopach map of blocher, member of New Albany shale, Western Kentucky, 6:15307 (METC/EGSP—902)
Isopach map of Grassy Creek, member of New Albany shale, Western Kentucky, 6:15310 (METC/EGSP—905)
Isopach map of Sweetland Creek, member of New Albany shale, Western Kentucky, 6:15308 (METC/EGSP—903)
North-South cross section, east side of area, 6:15309 (METC/EGSP—904)
North-South cross section, west side of area, 6:15306 (METC/EGSP—901)
Occurrence of natural gas in the New Albany shale, Western Kentucky, 6:15311 (METC/EGSP—906)
Structure map of the base of the New Albany shale, Western Kentucky, 6:15312 (METC/EGSP—907)
Kentucky Univ., Lexington (USA). Dept. of Chemical Engineering
Hot-gas desulfurization. I. Use of gasifier ash in a fixed-bed process. Final report, 6:15185 (DOE/ET/10463—T1(Vol.1))

L

La Quinta Motor Inns, Inc., San Antonio, TX (USA)
Solar hot water system installed at Las Vegas, Nevada. Final report, 6:15494 (DOE/NASA/CR—161642)
Lawrence Berkeley Lab., CA (USA)
Beam energy measurements at the Bevalac, 6:15986 (LBL—11692)
Corrosion of metals in oil shale environments, 6:15330 (LBL—12019)
Encouraging mature user behavior, 6:16331 (LBL—11452)
Excitation of shape-vibrational modes in nuclei by relativistic heavy ions, 6:16273 (RLO—1388-844)
Extended rate equations, 6:16245 (UCID—18932)
Hollow-fiber membranes for photosensitized electron transport, 6:15453 (LBL—12359)
Influence of grain boundary silica impurity on alumina toughness, 6:15840 (LBL—12190)
Kinetics of photosensitized electron transport across a membrane boundary, 6:15454 (LBL—12360)
Magnetic-field effects on photosensitized electron-transfer reactions, 6:15455 (LBL—12361)
Nitrogen oxides controversy, 6:16065 (LBL—12251)
Numerical simulation of survey misalignment effects in the ATA structure, 6:15987 (LBL—12296)
Physical oceanographic data from the OTEC Punta Tuna, Puerto Rico Site, September 1979-June 1980, 6:15490 (LBL—12327)
Ultrarelativistic heavy ions, 6:16014 (LBL—12053)
Lawrence Livermore National Lab., CA (USA)
Aluminum-air batteries for vehicles, 6:15806 (UCRL—85605)
Beam dynamics in the ETA and ATA 10 kA linear induction accelerators: observations and issues, 6:15992 (UCRL—85650)
Beam optics in the FXR 1.5 MeV, 4 kA injector, 6:15991 (UCRL—85074)
Boiling liquid cauldron status report, 6:16322 (UCID—18985)
Digital image processing software system using an array processor, 6:16337 (UCRL—85225)
Dynamic mechanical and thermal properties of seven polyurethane adhesives, 6:15844 (UCRL—82694(Rev.1))
Electronic component documentation in a research-laboratory environment, 6:15973 (UCRL—85105)
Environmental impacts of the production and utilization of carbonaceous fuels: a brief overview, 6:16126 (UCRL—85599)
Experimental test accelerator (ETA) II, 6:16015 (UCRL—85036)
FERMI: a code for modeling field-reversed magnetic-mirror fusion devices, 6:16302 (UCRL—85491)
Future aspects of modeling combustion chemistry, 6:15927 (UCRL—85585)
Laser irradiation of disk targets at 0.53 μm wavelength, 6:16323 (UCRL—84684(Rev.1))
Managing domains in a network operating system, 6:16338 (UCRL—85562)
Measurement of asymmetric flux in the gap of an induction accelerator module, 6:15990 (UCRL—85049)
Models for jointed rock structures, 6:16238 (UCRL—85624)
Quality-assurance requirements for automated water-quality laboratories, 6:16118 (UCRL—85311)
Solar coal gasification: plant design and economics, 6:15503 (UCRL—84610(Rev.1))
Testing of aluminum stainless steel bonds for long-term storage, 6:15829 (UCRL—84412)
Little (Arthur D.), Inc., Cambridge, MA (USA)
Break up of oil on rough seas - simplified models and step-by-step calculations. Final report, 6:15293 (AD-A—084240)
Effect of phased FGD implementation on power costs, 6:15630 (ADL—81231-03)
Los Alamos National Lab., NM (USA)
100-kV, 2-ns risetime, dc-coupled probe, 6:15636 (LA-UR—81-582)
Long-pulse applications of pulse-forming lines for high-power linac application, 6:16012 (LA-UR—81-766)
Variational ground states, magnetic responses, and dilution behavior of model valence-fluctuation systems, 6:16286 (LA-UR—81-467)
Voltage-breakdown testing for an RFQ structure, 6:16008 (LA-UR—81-752)
Water-cooled beam line components at LAMPF, 6:16006 (LA-UR—81-719)
Los Alamos Scientific Lab., NM (USA)
360° digital phase detector with 100-kHz bandwidth, 6:16011 (LA-UR—81-757)
Ballistic missile defense: a potential arms-control initiative, 6:16052 (LA—8632)
Beam-intensity limitations in linear accelerators, 6:15985 (LA-UR—81-765)
Comprehensive study of LASL Well C/T-2 Roosevelt Hot Springs KGRA, Utah, and applications to geothermal well logging, 6:15561 (LA—8686-MS)
Development of the reactor safety film, 6:15690 (LA-UR—80-2993)
Documentation of the valve model in DAPSY, 6:15675 (LA-tr—80-40)
Dynamic material property measurements using an improvement of the freely expanding ring technique, 6:15823 (LA-UR—81-623)
Effective Hamiltonian theory: recent formal results and non-nuclear applications, 6:16291 (LA-UR—81-403)
Experimental investigation of heating phenomena in linac mechanical interfaces due to RF field penetration, 6:16009 (LA-UR—81-753)
Explosively produced fracture of oil shale. Progress report, October-December 1979, 6:15327 (LA—8500-PR)
Explosively produced fracture of oil shale. Progress report, January-March 1980, 6:15328 (LA—8501-PR)
FMIT direct-current beam monitor, 6:16312 (LA-UR—81-759)
FMIT facility control system, 6:16313 (LA-UR—81-767)
Geostatistics project of the National Uranium Resource Evaluation Program. Progress report, April-September 1980, 6:15342 (LA—8734-PR)
High-radiation-zone design of the FMIT high-energy beam transport, 6:16315 (LA-UR—81-770)
Improved diffusion, 6:16297 (LA-UR—81-621)
Monitor 1981, 6:16007 (LA-UR—81-720)
New stringer for the LAMPF radiation effects facility, 6:16004 (LA-UR—81-684)
Noninterceptive transverse beam diagnostics, 6:16314 (LA-UR—81-769)
Nonlinear semigroup theory for systems, 6:16330 (LA-UR—81-488)
Observations of separatrix motion during the formation of a field-reversed configuration, 6:16309 (LA—8716-MS)
Penetration of >5-μ chrysotile asbestos fibers through DuPont Tyvek 1422A and Kimberly-Clark CPF fabrics, 6:16231 (LA—8712-MS)
Performance optimization of a cusp-field ion source and high-perveance extractor, 6:16311 (LA-UR—81-758)
Portable neutron measurement technique for the assay of ^{235}U in LWR fuel assemblies, 6:15411 (LA-UR—81-358)
Preliminary assessment of environmental, health, and safety issues in coal liquefaction, 6:15245 (LA—8578-MS)
Radio-frequency quadrupole: a new linear accelerator, 6:16013 (LA-UR—81-768)
Spectral absorption shifts in CuCl vs pressure to 147 kbar, 6:16285 (LA—8706-MS)
Transverse phase space time dependence of LAMPF's high intensity H+ beam, 6:15984 (LA-UR—81-761)

Vane fabrication for the proof-of-principle radio-frequency quadrupole accelerator, 6:16010 (LA-UR—81-756)
Water-cooled pyrolytic graphite targets at LAMPF: design and operation, 6:16005 (LA-UR—81-685)
X-ray diodes for laser fusion plasma diagnostics, 6:16296 (LA—7941-MS)

Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)
Diesel-exhaust emissions-toxicology program. Status report, 6:16124 (LMF—81)
Fluidized-bed combustion emissions: toxicology program. Status report, 6:15276 (LMF—83)

Lowell Univ., MA (USA). Research Foundation
Automatic ionospheric parameter extraction from digital ionogram data. Interim report, 6:16240 (AD-A—084101)

M

Main (Charles T.), Inc., Boston, MA (USA)
Electric Utility Rate Design Study: a discussion of a supply-side time-differentiated accounting-cost methodology, 6:15745 (NP—22592)

Manhattan Coll., New York (USA). Lab. for Plant Morphogenesis
Acidic precipitation: considerations for an air-quality standard, 6:16064 (BNL—29031)

Massachusetts Inst. of Tech., Cambridge (USA)
Crossed reaction networks in catalytic hydrodenitrogenation of synthetic liquid fuels. Quarterly report, August 1, 1980-October, 31, 1980, 6:15191 (DOE/PC/30075—3)
Crossed reaction networks in the catalytic hydrodenitrogenation of synthetic liquid fuels. Quarterly report, November 1, 1980-January 31, 1981, 6:15192 (DOE/PC/30075—4)
Hadron nucleus interactions, 6:16279 (CONF-800787—1)
Quantum mean-field theory of collective dynamics and tunneling, 6:16280 (CONF-810107—3)
Thermal energy diffusion in plasmas with weak ohmic heating, 6:16294 (CONF-800932—8)

Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Chemistry
N-type molybdenum diselenide-based photoelectrochemical cells: evidence for Fermi level pinning and comparison of the efficiency for conversion of light to electricity with various solvent/halogen/halide combinations. Interim technical report, 6:15440 (AD-A—088161)

Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering
Coolant mixing in LMFBR rod bundles and outlet plenum mixing transients. Progress report, 6:15648 (DOE/ET/37240—85)
Coolant mixing in LMFBR rod bundles and outlet plenum mixing transients. Progress report, September 1, 1980-November 30, 1980, 6:15649 (DOE/ET/37240—89)

Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Detection of electrically failed photovoltaic modules at MIT LL test sites, 6:15473 (DOE/ET/20279—112)
Detection of electrically failed photovoltaic modules at selected MIT Lincoln Laboratory test sites, 6:15474 (DOE/ET/20279—119)
Remote sensing of turbine engine gases. Final report 15 Jul 78-30 Sep 79, 6:15808 (AD-A—084544)

Mathtech, Inc., Arlington, VA (USA)
Bibliography of studies dealing with incentives and their impacts on energy development. Fianl report, 6:15724 (DOE/EI/11973—T1)

Metal Properties Council, Inc., New York (USA)
Program to discover materials suitable for service under hostile conditions obtaining in equipment for the gasification of coal and other solid fuels. Quarterly progress report, July 1, 1980-September 30, 1980, 6:15195 (FE—1784-69)

Meteorology Research, Inc., Altadena, CA (USA)
Kramer station fabric filter evaluation. Final report, 6:15631 (EPRI-CS—1669)

Meyer (A.F.) and Associates, Inc., McLean, VA (USA)
Analysis and comparison of five contractor safety and health manuals (EG & G, SR II, ORNL, Ashland, and MLGW), 6:16229 (DOE/ET/13650—12)

Miami Univ., FL (USA). Rosenstiel School of Marine and Atmospheric Sciences
Enhancement of hydrogen photoproduction by marine chromatium sp. Miami PBS 1071 grown in molecular nitrogen, 6:15442 (CONF-800793—1)

Minnesota Univ., St. Paul (USA). Agricultrual Experiment Station
Energy conservation in grain (corn) drying with combination high-temperature, low-temperature methods. Final report, July 1, 1978-September 30, 1980, 6:15780 (DOE/CS/40060—T1)

Mission Research Corp., Albuquerque, NM (USA)
Beam breakup instability in pulsed transmission line linear accelerators, 6:15988 (SAND—80-2437C)

Mitre Corp., McLean, VA (USA)
Anthropogenic climate change: assessing the responsibility of developed and developing countries, 6:16057 (DOE/EV/10281—2)

Motorola, Inc., Phoenix, AZ (USA). Semiconductor Group
Anti-reflection coatings applied by acid-leaching process. Final report, 6:15449 (DOE/JPL/955387—80/4)
Sequential purification and crystal growth for the production of low cost silicon substrates. Annual report, 15 September 1979-14 September 1980, 6:15451 (DOE/SERI—8119-3/4)

Motorola, Inc., Phoenix, AZ (USA). Solar Energy Dept.
Photovoltaic mechanisms in polycrystalline thin film silicon solar cells. Quarterly technical progress report No. 1, July 30-October 31, 1980, 6:15452 (DOE/SERI—9234/1)

Mound Facility, Miamisburg, OH (USA)
Assessment of the radiological impact of coal utilization. II. Radionuclides in western coal ash, 6:15633 (MLM—2810)
Observations regarding materials and site preparation for salt-gradient solar ponds, 6:15511 (MLM—2812(OP))
Testing of laminar flow, HEPA filter, clean installations at Mount Facility, 6:15931 (MLM—2800(OP))

Mount Holyoke Coll., South Hadley, MA (USA)
Studies of the photoelectrochemistry of organic dyes using attenuated total reflection techniques, 6:15445 (DOE/ER/10632—1)

N

National Aviation Facilities Experimental Center, Atlantic City, NJ (USA)
Dynamic air traffic control simulation of profile descent and high-speed approach fuel conservation procedures. Final report Jul 77-Aug 77, 6:15779 (AD-A—088232)

National Bureau of Standards, Washington, DC (USA)
Thermocouple reference tables based on the IPTS-68: reference tables in degrees fahrenheit for thermoelements versus platinum (Pt-67), 6:15932 (NBS-MN—125(Suppl.1))

National Bureau of Standards, Washington, DC (USA). Metallurgy Div.
Non-noble catalysts and catalyst supports for phosphoric acid fuel cells. 1st quarterly report, August-November 1980, 6:15765 (DOE/NASA/6229—1)

National Center for Atmospheric Research, Boulder, CO (USA)
Scenario of the impact of a future climate change on world food production, 6:16058 (DOE/EV/10281—7)

National Foreign Assessment Center (CIA), Washington, DC (USA)
Some perspectives on oil availability for the non-OPEC LDCs, 6:15292 (ER—80-10493)

National Measurement Lab. (NBS), Washington, DC (USA)
Slag characterization: viscosity of synthetic coal slag in steam, 6:15235 (NBSIR—80-2124)

National Oceanic and Atmospheric Administration, Oak Ridge, TN (USA). Atmospheric Turbulence and Diffusion Lab.
Environmental Research Laboratories annual report for 1979 and 1980, 6:16063 (ATDL—81/4)

National Petroleum Council, Washington, DC (USA)
Unconventional gas sources. Executive summary, 6:15303 (DOE/TIC—11417)

Naval Ocean Systems Center, San Diego, CA (USA)
Digital image analysis of two phase flow data. Final report for FY 79, 6:15956 (AD-A—084187)

Naval Postgraduate School, Monterey, CA (USA)
Analysis of a two-fluid EHD power generator including effects of compressibility, 6:15760 (AD-A—084125)

Computer program for the kinetics and populations in a xenon fluoride laser. Master's thesis, 6:15954 (AD-A—084459)

Naval Research Lab., Washington, DC (USA)
Structural integrity of water reactor pressure boundary components. Quarterly progress report Oct-Dec 79, 6:15686 (AD-A—084553)

Naval Weapons Center, China Lake, CA (USA)
Evaluation of geothermal potential of Range Bravo 20, Naval Air Station, Fallon. Final report May-Aug 79, 6:15560 (AD-A—084080)

Nebraska Univ., Lincoln (USA). Dept. of Mechanical Engineering
Psuedo-shock as a qualitative model in the investigation of the influence of wall roughness on the performance of supersonic MHD generators. Final report, 6:15752 (AD-A—088333)

New Jersey Inst. of Tech., Newark (USA)
Sorbate characteristics of fly ash. Semi annual progress report, 6:15232 (DOE/PC/30231—T1)

New Mexico Univ., Albuquerque (USA). Technology Application Center
Solar power generation: a bibliography with abstracts. Quarterly update, October-December 1980, 6:15438 (TAC-STPG—80-004)
Solar thermal components. Quarterly update, October-December 1980, 6:15502 (TAC-STC—80-004)

North Dakota Univ., Grand Forks (USA). Engineering Experiment Station
Evaluation of hydrothermal resources of North Dakota. Phase I, Final technical report, 6:15557 (DOE/ID/12030—12)

NUS Corp., Clearwater, FL (USA)
Long-term corrosion of Cr-Mo steels in superheated steam at 482 and 538°C, 6:15814 (CONF-810402—8)

O

Oak Ridge Associated Universities, Inc., TN (USA)
Summer Science Student Program: a replication manual, 6:16327 (ORAU—177)

Oak Ridge Gaseous Diffusion Plant, TN (USA)
FILLGEN: fill table generator for RELAP4, 6:15646 (K/CSD/TM—39)
Formation and collision of isothermal shock waves in a torus, 6:15958 (K/CSD/TM—41)
Uranium resource evaluation project quality assurance evaluation, 6:15341 (K/UR—46)

Oak Ridge National Lab., TN (USA)
Acidic precipitation: considerations for an air-quality standard, 6:16064 (BNL—29031)
Advanced Two-Phase Flow Instrumentation Program quarterly progress report for October-December 1979, 6:15670 (NUREG/CR—1346)
Application of geophysical measurement techniques in the localization of brine and the determination of the structure and boundaries of salt deposits. Localization of brine in salt mines using high frequency, 6:16234 (ORNL-tr—4699)
Consolidated fuel-reprocessing program. Progress report October 1-December 31, 1980, 6:15358 (ORNL/TM—7657)
Corrosion of the wash solvent column at the Fort Lewis, Washington, solvent-refined-coal pilot plant, 6:15207 (ORNL/TM—7638)
Directory of parameters used in a series of assessment applications of the AIRDOS-EPA and DARTAB computer codes, 6:15406 (ORNL—5710)
Engineering Physics Division progress report for period ending November 30, 1980, 6:16269 (ORNL—5725)
Evaluation of tubular ceramic heat-exchanger materials in residual-oil-combustion environment, 6:15782 (ORNL/TM—7578)
Hydrogen and chlorine detection at the SiO_2/Si interface, 6:15838 (CONF-810231—1)
Leap Model 22C results versus EIA 1979 report, 6:15719 (ORNL/TM—7739)
Long-term corrosion of Cr-Mo steels in superheated steam at 482 and 538°C, 6:15814 (CONF-810402—8)
MAD: a computer program for ACES design using monthly thermal loads, 6:15772 (ORNL/CON—51)
MASFLO: a computer code to calculate mass flow rates in the Thermal-Hydraulic Test Facility (THTF). Technical report, 6:15691 (NUREG/CR—1239)
New directions for district heating in the United States, 6:15787 (CONF-810423—3)
Oak Ridge 25-MV tandem accelerator, 6:16002 (CONF-810314—37)
Orbit dynamics in isochronous cyclotrons, 6:15983 (CONF-810314—46)
Overview of the US industrial thermal energy storage program, 6:15731 (CONF-810423—2)
Plateau diffusion coefficient for arbitrary flux surface geometry, 6:16316 (ORNL/TM—7584)
Rapidly pulsed synchrotron for heavy-ion acceleration, 6:16003 (CONF-810314—45)
Roofing felt on polystyrene, 6:15775 (ORNL/tr—4679)
Silica scaling in simulated geothermal brines, 6:15573 (ORNL/TM—7681)
Simulation of a PCM storage subsystem for air conditioning assist, 6:15773 (ORNL/CSD—77)
Source book for planning nuclear dual-purpose electric/distillation desalination plants, 6:15663 (ORNL/TM—7190)
Stable isotope research pool inventory, 6:15418 (NEANDC(US)—204/A(12-80))
TERPED: a versatile code for examining the distribution of experimental data, 6:16332 (ORNL—5689)
Uranium recovery from low-level aqueous sources, 6:15352 (ORNL/TM—7652)
US Department of Energy environmental compliance program hanbook: federal regulations on air quality, Fossil Energy, 6:16080 (ORNL/EIS—176)
Uses of AES and RGA to study neutron-irradiation-enhanced segregation to internal surfaces, 6:15812 (CONF-800205—15)
Validation tests of the venture finite-difference diffusion theory neutronics code, 6:15665 (ORNL/TM—7634)

Oak Ridge Y-12 Plant, TN (USA)
Energy-conscious air-side design: Phase I of energy use minimization, 6:15961 (Y/EN—501)
Materials for high-temperature hydrogen fluorine environments. Final report, June 1976-December 1978, 6:15841 (Y—2201)
Rockwell-Rocketdyne flywheel test results, 6:15710 (Y/DX—244)

Office of the Publication Board, Washington, DC (USA)
Automobile air pollution: automotive fuels. 1970-May, 1980 (citations from the NTIS Data Base). Report for 1970-May 80, 6:15811 (PB—80-810948)
Combustion of drops and sprays of No. 2 diesel oil and its emulsions with water and methanol. Volume I (experimental). Final report Jul 78-Aug 79, 6:15301 (PB—80-178213)
Combustion of drops and sprays of No. 2 diesel oil and its emulsions with water and methanol. Volume II (theoretical). Final report Jul 78-Aug 79, 6:15302 (PB—80-178221)
Hydrogen storage: storage as a gas or liquid. 1974-May, 1980 (citations from the NTIS Data Base). Report for 1974-May 80, 6:15425 (PB—80-811086)
Hydrogen storage: hydrogen as a hydride. 1974-May, 1980 (citations from the NTIS Data Base). Report for 1974-May 80, 6:15426 (PB—80-811094)
Two-phase flow model test facility. Interim report 15 Aug 75-31 Jan 77, 6:15960 (PB—80-181647)
Wood and energy in New England: a review and bibliography. Bibliographies and literature of agriculture, 6:15456 (PB—80-176878)

Ohio State Univ., Columbus (USA). Dept. of Metallurgical Engineering
Hydrogen attack of pressure-vessel steel. Progress report, April 1, 1980-March 31, 1981, 6:15815 (DOE/ER/02872—5)

Otisca Industries, Ltd., Syracuse, NY (USA)
Heavy-liquid beneficiation of fine coal. First quarterly report, September 18, 1980-December 31, 1980, 6:15267 (DOE/PC/20139—T1)
Otisca Process: a pilot plant study of dense liquid separation, 6:15268 (EPRI-CS—1705)

P

Peat, Marwick, Mitchell and Co., Washington, DC (USA)
Financial and physical capacity of the Burlington Northern Railroad to move western coal, 6:15729 (ANL/EES-TM—123)
Pennsylvania State Univ., University Park (USA)
Hydrogen and chlorine detection at the SiO_2/Si interface, 6:15838 (CONF-810231—1)
Pennsylvania State Univ., University Park (USA). Dept. of Chemistry
Development of instrumental methods of analysis of sulfur compounds in coal process streams. Twelfth quarterly technical progress report, July-September 1980, 6:15230 (DOE/ET/10482—12)
Development of instrumental methods of analysis of sulfur compounds in coal process streams. Quarterly technical progress report for October-December 1980, 6:15231 (DOE/ET/10482—13)
Monte Carlo simulation of isotope separation in opposed jets, 6:15867 (K/OA—4728)
Pennsylvania State Univ., University Park (USA). Materials Research Labs.
Black a-Si:H sputtered films for photovoltaic solar cells. Final technical progress report, May 15, 1979-May 15, 1980, 6:15446 (DOE/ET/23038—4)
Controlled cadmium telluride thin films for solar cell applications. Second quarterly report, September 1-December 1, 1980, 6:15460 (SERI/PR—9131-1-T2)
Pennsylvania Univ., Philadelphia (USA). Energy Center
Analysis of the impact of decentralized solar technology on electric utilities: comparison and synthesis of models. Progress report, 6:15493 (DOE/CS/30438—1)
Pennzoil Co., Vienna, WV (USA)
Rock Creek Carbon Dioxide Pilot Project. Annual report, July 1979-June 1980, 6:15286 (DOE/MC/05301—62)
Pittsburg and Midway Coal Mining Co., Englewood, CO (USA)
Solvent refined coal (SRC) process. Quarterly technical progress report, January 1980-March 1980, 6:15183 (DOE/ET/10104—T13)
Pittsburgh Univ., PA (USA)
Studies of the applicability of optoelectronics devices for instrumentation in high energy physics. Proposed program, 6:16329 (DOE/ER/10667—1)
Power Reactor and Nuclear Fuel Development Corp., Oarai (Japan)
Power coefficient anomaly in Joyo, 6:15682 (JAPFNR—565)
Princeton Energy Group, NJ (USA)
Daylighting design analysis. Project status report No. 2, 1 March-31 December 1980, 6:15767 (DOE/CS/30367—2)
Princeton Univ., NJ (USA)
Future aspects of modeling combustion chemistry, 6:15927 (UCRL—85585)
Two-dimensional eigenmode analysis of the trapped-ion instability, 6:16304
Princeton Univ., NJ (USA). Dept. of Chemical Engineering
Short-residence-time hydropyrolysis of coal. Technical progress report, 1 July 1980-31 September 1980, 6:15187 (DOE/ET/13153—4)
Princeton Univ., NJ (USA). Plasma Physics Lab.
Active tokamak limiters; symmetrizing the edge plasma, 6:16318 (PPPL—1743)
Alfven wave cyclotron resonance heating, 6:16298 (PPPL—1750)
Hydrogen isotope analysis by quadrupole mass spectrometry, 6:16300 (PPPL—1767)
Modeling of ICRF heating in PLT, 6:16299 (PPPL—1754)
Neutral beam injector performance on the PLT and PDX tokamaks, 6:16317 (PPPL—1728)
Temporary fire sealing of penetrations on TFTR, 6:16319 (PPPL—1747)
Purdue Univ., Lafayette, IN (USA)
Effects of internal gas pressure and microstructure on the mechanisms of hot-pressing and swelling in ceramics. Final report, June 1, 1979-May 31, 1980, 6:15839 (COO—2713-5)
Purdue Univ., Lafayette, IN (USA). School of Mechanical Engineering
Quantitative measurements in laser-induced plasmas using optical probing. Final report, 6:16295 (COO—4001-8)
Putnam, Hayes and Bartlett, Inc., Cambridge, MA (USA)
Electric Utility Rate Design Study: a framework for evaluating the cost-tracking capabilities of alternative residential rate structures, 6:15746 (NP—22594)

R

Radiation Monitoring Devices, Inc., Watertown, MA (USA)
Applications of CdTe to nuclear medicine. Annual report, February 1, 1979-January 31, 1980, 6:16166 (DOE/EV/02541—1)
High efficiency thin film CdTe solar cells. Second quarterly progress report, July 1, 1980-September 30, 1980, 6:15461 (SERI/PR—9133-1-T1)
RAND Corp., Santa Monica, CA (USA)
Eastern Europe and oil: the Soviet dilemma, 6:15289 (AD-A—084153)
Rensselaer Polytechnic Inst., Troy, NY (USA)
Chemical diffusion on solid surfaces. Final report, 6:15861 (COO—4220-4)
Rheinische Braunkohlenwerke A.G., Koeln (Germany, F.R.)
Final report on the reference-design of the prototype plant for hydrogasification of coal in the framework of the PNP-project, 6:15181 (BMFT-FB-T—80-160)
Rice Univ., Houston, TX (USA). Dept. of Physics
Search for narrow resonances in $pp \rightarrow p\pi^+ n$ at 2 GeV/c, 6:16259 (ANL-HEP-CP—80-26)
Rochester Univ., NY (USA)
Pressure mediated reduction of ultrasonically-induced cell lysis, 6:16227 (UR—3490-1982)
Spontaneous mitotic recombination in the mms8-1 mutant of Saccharomyces cerevisiae, 6:16160 (UR—3490-1980)
Rockwell International Corp., Anaheim, CA (USA). Electronic Devices Div.
Thin films of InP for photovoltaic energy conversion. Final report, July 5, 1979-July 4, 1980, 6:15443 (COO—3004-4)
Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group
Financial study of commercialization of solar central receiver power systems. Final report, 6:15481 (DOE/SF/11421—1)
Molten salt coal gasification process development unit, Phase 2. Quarterly technical progress report No. 1, July-September 1980, 6:15184 (DOE/ET/10290—70)
Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations
Energy is good for your health: a plea for completeness in health-impact assessments, 6:16125 (RHO-SA—190)
Ruhrkohle A.G., Essen (Germany, F.R.)
Flameproof television camera set for the observation of coal seams and rock strata as well as of tectonic surfaces in underground boreholes. Final report, 6:15248 (BMFT-FB-T—80-149)

S

Sandia Labs., Albuquerque, NM (USA)
Independent verification testing: analyses of alternatives for conducting independent verification testing of environmentally qualified safety-related equipment. Technical report, 6:15692 (NUREG/CR—1287)
Methodology for evaluating safeguards capabilities for licensed nuclear facilities. Final report, 6:15412 (NUREG/CR—1381)
Qualification testing evaluation program light-water reactor safety research. Quarterly report apr-jun 79, 6:15694 (NUREG/CR—1343)
Two-phase jet loads. Fiscal year 1979 annual report, 6:15693 (NUREG/CR—1292)
Sandia National Labs., Albuquerque, NM (USA)
Aerodynamic tests of a Strypi II/NASA/ECHO at Mach numbers of 4.98 and 7.82 (Test VI-101), 6:15933 (SAND—80-1614)
Beam breakup instability in pulsed transmission line linear accelerators, 6:15988 (SAND—80-2437C)
Beneficial uses of nuclear waste program: sewage sludge irradiation project, FY 1981 project plan, 6:16196 (SAND—81-0431)
Brief history of laminar flow clean room systems, 6:15935 (SAND—81-0261C)

CDC/1000: a Control Data Corporation remote batch terminal emulator for Hewlett-Packard minicomputers, 6:16333 (SAND—80-2548)
Comparison of ground motion from earthquakes and underground nuclear weapons tests at NTS, 6:16055 (SAND—81-0501C)
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Geology of Nash Draw, Eddy County, New Mexico, 6:16233 (USGS-OFR—81-31)
Introducing the new photovoltaic data reduction center, 6:15476 (SAND—80-2576C)
Lagrangian measurement platform flights in support of the Tennessee Plume Study: field effort and data, 6:16073 (SAND—79-1336)
Leaching and oil fill schedules for the strategic petroleum reserve (SPR), 6:15299 (SAND—80-2784)
Light ion ignitors for inertial confinement fusion: progress toward proof-of-principle, 6:16321 (SAND—81-0445C)
Line-focus solar thermal energy technology development. A seminar for industry, 6:15512 (SAND—80-1666)
LSI packaging that passes PIND test, 6:15972 (SAND—81-0491C)
Measurement and calculation of radiation fields of the Sandia irradiator for dried sewage solids, 6:15934 (SAND—80-2791)
Midtemperature solar systems test facility predictions for thermal performance based on test data: solar kinetics T-600 solar collector with FEK 244 reflector surface, 6:15549 (SAND—80-1964/9)
Migration of cesium-137 through a solid core of Magenta dolomite taken from th Rustler Formation in Southeastern New Mexico, 6:15373 (SAND—80-1259)
Nuclear material operations manual, 6:15413 (SAND—77-1936(Rev.)(2-81))
Optimization of a high-voltage plasma focus machine, 6:16303 (SAND—81-6005)
Physical and mechanical properties of cast 17-4 PH stainless steel, 6:15828 (SAND—80-2302)
Plant design and nuclear power plant protection, 6:15414 (SAND—80-2569C)
Preliminary analysis of two aspects of magma-powered electric-generation plants, 6:15570 (SAND—80-1522)
Project DEEP STEAM quarterly report, July 1-September 30, 1980, 6:15287 (SAND—80-2873)
Pulsed uv laser Raman spectroscopy of silane in a linear flow CVD reactor, 6:15848 (SAND—81-0568C)
Report on the development of equipment and techniques for drilling and machining bedded salt, 6:15375 (SAND—80-2603)
Results of borehole gravity surveys in two SPR wells, 6:15298 (SAND—80-2482)
Results of deep water acoustic telemetry development tests, 6:16034 (SAND—81-0298)
Retention and release of hydrogen in graphite and related materials, 6:16320 (SAND—81-0037C)
SOLSTOR description and user's guide, 6:15475 (SAND—79-2330)
Solubility and sorption characteristics of uranium(VI) associated with rock samples and brines/groundwaters from WIPP and NTS, 6:15405 (SAND—80-1595)
Sorption of cesium and strontium from concentrated brines by backfill barrier materials, 6:15374 (SAND—80-2046)
User's manual for computer code SOLTES-1B: simulator of large thermal energy systems, 6:15482 (SAND—78-1315(Rev.))
User's manual for the Functional Relay Operation Monitor (FROM), 6:15970 (SAND—80-1915)
Varistor-initiated arcs in lightning arrestor connectors, 6:15637 (SAND—80-2457C)
Workshop on geothermal drilling fluids, 6:15574 (SAND—79-7117)

Santa Fe Energy Co., Santa Fe Springs, CA (USA). Chanslor Div.
200 Steamflood Demonstration Project. Fourth annual report, June 1979-June 1980, 6:15283 (DOE/ET/12059—4)

Schnabel Engineering Associates, Richmond, VA (USA)
National Dam Safety Program. Middle Fork Slurry Impoundment (ID No. VA-16708), Tennessee River Basin, Middle Fork of Dumps Creek, Russell County, Virginia. Phase I inspection report. Final report, 6:15629 (AD-A—084370)

Science Applications, Inc., Ames, IA (USA)
Selection methodology for LWR safety R and D programs and proposals. Volume III. User's manual for the multi-attribute utility package (MAUP), 6:15687 (ALO—135)

Science Applications, Inc., Ann Arbor, MI (USA). Optical Sciences Div.
Infrared electro-optic system performance effects due to absorption by battlefield gases. Final report, 6:15951 (AD-A—084249)

Science Applications, Inc., McLean, VA (USA)
MX MPS deployment, an on-site fallout evaluation. Final report 12 Jul-29 Dec 78, 6:16044 (AD-A—084643)

Science Applications, Inc., Steamboat Springs, CO (USA)
Models for jointed rock structures, 6:16238 (UCRL—85624)

SDC Integrated Services, Inc., San Diego, CA (USA)
Peat prospectus, 6:15249 (DOE/ET/10159—T6)

Shell Oil Co., New Orleans, LA (USA)
Chemical flood progress evaluation test, South Pass Block 27 field, Plaquemines Parish, Louisiana. Final report, September 28, 1979-May 16, 1980, 6:15284 (DOE/ET/14033—1)

Solar Energy Research Inst., Golden, CO (USA)
Assessment of existing studies of wind loading on solar collectors, 6:15552 (SERI/TR—632-812)
Electric utility value determination for wind energy. Volume I. A methodology, 6:15595 (SERI/TR—732-604(Vol.1))
Electric utility value determination for wind energy. Volume II. A user's guide, 6:15596 (SERI/TR—732-604(Vol.2))
Operation and design of selected industrial process heat field tests, 6:15500 (SERI/TP—632-1113)
Preparation and properties of evaporated CdTe films compared with single crystal CdTe. Progress report No. 1, October 1, 1980-January 31, 1981, 6:15464 (SERI/PR—9330-1-T1)
Solar energy, conservation, and rental housing, 6:15774 (SERI/RR—744-901)
Wind loading on tracking and field-mounted solar collectors, 6:15551 (SERI-TP—632-958)

South Dakota School of Mines and Technology, Rapid City (USA)
Sedimentology and uranium potential of the Inyan Kara Group, near Buffalo Gap, South Dakota. Final report, 6:15344 (GJBX—66(81))

Southern California Edison Co., Rosemead (USA)
Test and evaluation of methanol in a gas turbine system. Final report, 6:15616 (EPRI-AP—1712)

Southwest Research Inst., San Antonio, TX (USA). Army Fuels and Lubricants Research Lab.
Army experience and requirements for stability and cleanliness of diesel fuels. Interim report, 6:15300 (AD-A—088008)

Spectrolab, Inc., Sylmar, CA (USA)
Silicon-solar-cell process development, fabrication, and analysis. Final report, 6:15448 (DOE/JPL/955055—81/6)

Sprague Electric Co., North Adams, MA (USA)
Corrosion of the wash solvent column at the Fort Lewis, Washington, solvent-refined-coal pilot plant, 6:15207 (ORNL/TM—7638)

SRI International, Menlo Park, CA (USA)
Laboratory investigation of containment in underground nuclear tests. Final report 1 Jan-30 Nov 77, 6:16049 (AD-A—084662)

Stanford Linear Accelerator Center, CA (USA)
Quark structure of nuclei, 6:16282 (SLAC-PUB—2667)
Study of natural spin-parity strange meson radial excitations in $K^- p \rightarrow K^- \pi^+ n$ at 11 GeV/c, 6:16257 (SLAC—238)

Stanford Research Inst., Arlington, VA (USA)
Free electron lasers with variable parameter wigglers. Technical report, 6:15953 (AD-A—084323)

Stanford Univ., CA (USA). Computer Systems Lab.
Theory of interpretive architectures: ideal language machines. Technical report No. 170, 6:16335 (SU—326-P.39-31)

Stanford Univ., CA (USA). Dept. of Computer Science
Equidistributing meshes with constraints, 6:16336 (SU—326-P3069)

Numerical analysis. Progress report, 1 November 1979-31 October 1982, 6:16334 (SU—326-P30-68)

Stanford Univ., CA (USA). High Temperature Gasdynamics Lab.
High magnetic field MHD generator program. Annual report, October 1, 1979-September 30, 1980, 6:15758 (DOE/ET/15611—3)
Optical diagnostic measurements of coal-slag parameters in combustion MHD systems, 6:15757 (DOE/ET/15611—2)

Stanford Univ., CA (USA). Inst. for Communication Research
Potential market for solar equipment among California homeowners. Final report, 6:15496 (P—400-80-034)

Stanford Univ., CA (USA). Petroleum Research Inst.
Determining the end of infinite-acting behavior for producing wells in closed rectangles. Report SUPRI TR-19, 6:15282 (DOE/ET/12056—19)
Further results determining permeability and thickness for a multi-layer five spot tracer test, 6:15281 (DOE/ET/12056—17)

Stearns-Roger, Inc., Denver, CO (USA)
Bi-gas pilot plant operation. Technical progress report, 1 July 1980-30 September 1980, 6:15189 (DOE/ET/14705—15)
Kramer station fabric filter evaluation. Final report, 6:15631 (EPRI-CS—1669)

Stone and Webster Management Consultants, Inc., New York (USA)
Electric Utility Rate Design Study: issues in load research (Topic Paper 3), 6:15748 (NP—25276)

Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme
Study of a temperature-stabilized heat pipe system with electrical feedback, 6:15930 (IKE—5-196)

Systems Control, Inc., Palo Alto, CA (USA)
Introduction of electric vehicles into the utility system: analysis of research needs. Final report, 6:15744 (EPRI-EM—1716)

Systems, Science and Software, La Jolla, CA (USA)
Effects of pipe wall mass distribution in line-of-sight nuclear tests. Topical report Sep 77-Jul 78, 6:16047 (AD-A—084652)
Spherically symmetric numerical simulation of the SRI grout spheres containment experiments. Topical report 1 Jan-31 Oct 78, 6:16045 (AD-A—084648)

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Technische Hochschule Darmstadt (Germany, F.R.). Inst. fuer Kernphysik
Gross properties of nuclei and nuclear excitations. Proceedings, 6:16267 (INIS-mf—6088)
Gross properties of nuclei and nuclear excitations. Proceedings. Pt. A: Nuclear collisions, 6:16268 (INKA-Conf—79-001-000)

Teledyne Geotech, Alexandria, VA (USA). Seismic Data Lab.
Seismic discrimination of earthquakes and explosions, with application to the Southwestern United States. Technical report, 6:16053 (AD-A—084118)

Temple, Barker and Sloane, Inc., Lexington, MA (USA)
Electric Utility Rate Design Study: customer acceptance of time-differentiated rates and load controls (Topic Paper 5), 6:15747 (NP—22595)

Tennessee Univ., Tullahoma (USA). Space Inst.
MHD Coal Fired Flow Facility. Quarterly technical progress report, July-September 1980, 6:15756 (DOE/ET/10815—54)
MHD Coal-Fired Flow Facility. Quarterly technical progress report, April-June 1980, 6:15755 (DOE/ET/10815—50)

Texas A and M Univ., College Station (USA)
Evaluation of brine disposal from the Bryan Mound site of the strategic petroleum reserve program. Final report, 6:15297 (DOE/PO/10114—2)
GaP Schottky diodes for high temperature applications, 6:15563 (SAND—81-0054C)

Texas A and M Univ., College Station (USA). Center for Tectonophysics
Mechanical and transport properties of rocks at high temperatures and pressures. Task I, the physical nature of fracturing at depth. Technical progress report No. 1, 1 March 1980-30 November 1980, 6:16236 (DOE/ER/10361—1)

Thermocore, Inc., Leola, PA (USA)
Cost-effective solar collectors using heat pipes. Interim progress report No. 2, April 1978-September 1978, 6:15506 (DOE/CS/34099—T2)

Thermo Electron Corp., Waltham, MA (USA)
Coal-fired furnace for testing of thermionic converters. Topical report, 6:15761 (TE—4258-81-81)
DOE/JPL advanced thermionic technology program. Progress report No. 44, July, August, September 1980, 6:15762 (TE—4258/4247-72-81)
DOE/JPL advanced thermionic technology program. Progress report No. 45, October, November, December 1980, 6:15763 (TE—4258/4247-149-81)

Triangle Universities Nuclear Lab., Durham, NC (USA)
TUNL XIX. Annual report, January 1-December 31, 1980, 6:16271 (DOE/ER/03624—21)

TRW Defense and Space Systems Group, Redondo Beach, CA (USA). Energy Technology Dept.
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TRW Energy Engineering Div., McLean, VA (USA)
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UKAEA Risley Nuclear Power Development Establishment, Culcheth. Safety and Reliability Directorate
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UKAEA Springfields Nuclear Power Development Labs.
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Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.
Modern gas centrifuge and rarefied-gas dynamics, 6:15354 (K/OA—4722)
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United Nations, Geneva (Switzerland). Economic Commission for Europe
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UOP, Inc., San Diego, CA (USA)
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URS/Madigan-Praeger, Inc., New York (USA)
Comprehensive study of the Tocks Island Lake Project and alternatives. Contract report, 6:15598 (AD-A—084399)

USAEC, Washington, DC
Operation SNAPPER. Nevada Proving Grounds, April-June 1952. Project 6.5. Decontamination of aircraft. Report to the Test Director, 6:16051 (AD-A—995023)

USDOE Assistant Secretary for Resource Applications, Washington, DC. Office of Naval Petroleum and Oil Shale Reserves
Annual report of operations, 6:15291 (DOE/RA—0011(80))

USDOE Energy Information Administration, Washington, DC. Short-Term Analysis Div.
Short-term energy outlook, 6:15735 (DOE/EIA—0202/5)

USDOE Office of the Secretary, Washington, DC. Interagency Coal Export Task Force
Interim report of the interagency coal export task force: draft for public comment, 6:15275 (DOE/FE—0012)

Utah Univ., Salt Lake City (USA). Dept. of Mining and Fuels Engineering
Chemistry and catalysis of coal liquefaction, catalytic and thermal upgrading of coal liquid and hydrogenation of CO to produce fuels. Quarterly progress report, April-June 1980, 6:15188 (DOE/ET/14700—3)

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Varian Associates, Inc., Palo Alto, CA (USA)
Materials for high efficiency monolithic multigap concentrator solar cells. Semi-annual report, 1 July-31 December 1980, 6:15466 (SERI/TR—8081-1-T3)

Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)
$CdSiAs_2$ thin films for solar cell applications. First quarter report, 4/9/80-7/8/80, 6:15457 (SERI—9143/QPR-1)

$CdSiAs_2$ thin films for solar cell applications. Second quarter report, 7/9/80-10/8/80, 6:15458 (SERI—9143/QPR-2)

Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Mining and Minerals Engineering

Design optimization in underground coal systems. Volume II. The RESERV-COAL program. Final technical report, February 28, 1981, 6:15256 (FE—1231-20)

Design optimization in underground coal systems. Volume IV. A theoretical yield-pillar design technique using the finite-element method of stress analysis. Final technical report, February 28, 1981, 6:15257 (FE—1231-22)

Design optimization in underground coal systems. Volume VI. LHDSIM: a load-haul-dump simulator for room-and-pillar mining systems. Final technical report, 6:15258 (FE—1231-24)

Design optimization in underground coal systems. Volume IX. Modified FACESIM and COST-SCHED programs. Final technical report, 6:15259 (FE—1231-27)

Design optimization in underground coal systems. Volume III. Structural characterization of coal. Final technical report as of February 28, 1981, 6:15234 (FE—1231-21)

Virginia Univ., Charlottesville (USA)

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Wapora, Inc., Chevy Chase, MD (USA)

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Washington Univ., Seattle (USA). Dept. of Nuclear Engineering

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Washington Univ., Seattle (USA). Dept. of Physics

Excitation of shape-vibrational modes in nuclei by relativistic heavy ions, 6:16273 (RLO—1388-844)

Weidlinger Associates, New York (USA)

TRANAL user's guide, Part 1. (Small strain, small displacement version). Final report 1 Oct 75-31 Dec 78, 6:16048 (AD-A—084654)

Westinghouse Electric Corp., East Pittsburgh, PA (USA). Advanced Systems Technology Div.

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Economic assessment of advanced central-receiver solar-thermal power systems. Executive summary, 6:15480 (DOE/SF/10601—T1)

Westinghouse Electric Corp., Lester, PA (USA)

Ocean thermal energy conversion power system development. Phase II. Final design report, 6:15489 (DOE/ET/21039—1)

Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.

Module Experimental Process System Development Unit (MEPSDU). Quarterly report No. 1, November 26, 1980-February 28, 1981, 6:15450 (DOE/JPL/955909—81/1)

Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Power Systems Dept.

Feasibility of recycling thorium in a fusion-fission hybrid/PWR symbiotic system, 6:15662 (WFPS-TME—80-016)

Westinghouse Electric Corp., Tampa, FL (USA). Nuclear Equipment Div.

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Westinghouse Electric Corp., Trafford, PA (USA). Power Circuit Breaker Div.

Evaluation, design, development, and delivery of a 1200-kV prototype termination. Eighth technical progress report, September 1-November 30, 1980, 6:15635 (DOE/ET/29068—T4)

West Virginia Univ., Morgantown (USA). Dept. of Geology and Geography

Analysis of the structural parameters that influence gas production from the Devonian shale. Annual progress report, 1979-1980, 6:15315 (DOE/ET/12138—T1(Vol.1))

Wisconsin Univ., Madison (USA). Dept. of Chemistry

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Qualifier
Title, (supplementary information), citation number, (report number)

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

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	6:15547	*See* SAND-80-1666
	6:15548	*See* SAND-80-1666
	6:15554	*See* SAND-80-1666
CONF-800994-	(International symposium on H.E. physics with polarized beams and polarized targets, Lausanne, Switzerland, 25 Sep-1 Oct 1980)	
12	6:16254	*See* ANL-HEP-CP-80-66
CONF-8009102-	(Joint power conference, Phoenix, AZ, USA, 28 Sep-2 Oct 1980)	
2	6:15681	*See* HEDL-SA-2214
CONF-8009132-	(14. European conference on laser interaction with matter, Palaiseau, France, 15-19 Sep 1980)	
1(Rev.1)	6:16323	*See* UCRL-84684(Rev.1)
CONF-8009135-	(Conference on the mechanics of nondestructive testing, Blacksburg, VA, USA, 10-12 Sep 1980)	
1	6:15969	*See* IS-M-288
CONF-8009136-	(Workshop in nuclear physics, Philadelphia, PA, USA, 1-5 Sep 1980)	
1	6:16273	*See* RLO-1388-844
CONF-8009137-	(APCA conference on the proposed SO/sub x/ and particulate standards, Atlanta, GA, USA, 16-18 Sep 1980)	
1	6:16064	*See* BNL-29031
CONF-801074-	(8. annual DOE compatibility meeting, Los Alamos, NM, USA, 14-16 Oct 1980)	
4	6:15829	*See* UCRL-84412
CONF-8010144-	(International conference on European waste-to-energy technology, Reston, VA, USA, 29-31 Oct 1980)	
	6:15600	*See* ANL/CNSV-TM-14
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CONF-8010161-	(14. Los Alamos Meson Physics Facility users group meeting, Los Alamos, NM, USA, 27-28 Oct 1980)	
1	6:16014	*See* LBL-12053
CONF-8010162-	(American Society of Metals conference, Pittsburgh, PA, USA, 28 Oct 1980)	
1	6:15182	NTIS, PC A03/MF A01
CONF-8010165-	(American Vacuum Society international industrial seminar on pilot plant experiences: melting and processing technology, Seabrook Island, SC, USA, 13-15 Oct 1980)	
1	6:15826	*See* PNL-SA-8955
CONF-8010167-	(Topical workshop on the production of new particles in super-high energy collisions, Madison, WI, USA, 22-24 Oct 1980)	
1	6:16264	*See* ANL-HEP-CP-79-42
CONF-801103-	(IEEE nuclear science symposium, Orlando, FL, USA, 5-7 Nov 1980)	
55	6:16035	*See* ANL-HEP-CP-80-74
CONF-801104-	(73. annual meeting of the American Institute of Chemical Engineers, Chicago, IL, USA, 12-16 Nov 1980)	
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CONF-801107-	(ANS international conference, Washington, DC, USA, 17-21 Nov 1980)	
65	6:16125	*See* RHO-SA-190
CONF-801119-	(22. annual meeting of the division of plasma physics of the APS, San Diego, CA, USA, 10-14 Nov 1980)	
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CONF-801128-	(Mechanical, magnetic, underground energy storage contractors review, Washington, DC, USA, 10-13 Nov 1980)	
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CONF-801137-	(Workshop on energy policy analysis, Urbino, Italy, 3 Nov 1980)	
4	6:15717	*See* BNL-28727
CONF-801183-	(Conference on hot dense matter, Monterey, CA, USA, Nov 1980)	
1	6:16297	*See* LA-UR-81-621
CONF-801184-	(National conference on municipal and industrial sludge composting, Philadelphia, PA, USA, 17-19 Nov 1980)	
1	6:15788	*See* SAND-80-7162C

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CONF-801185-		(Symposium on fuels and feedstocks from tropical biomass, San Juan, Puerto Rico, 24-25 Nov 1980)
1	6:15468	Chicago, IL; Institute of Gas Technology (1980).
CONF-801186-		(International conference on low-level activity measurement: low activities, Strbske Pleso, Czechoslovakia, 24-28 Nov 1980)
1	6:15853	*See* PNL-SA-8912
CONF-801203-		(National conference on renewable energy technologies, Honolulu, HI, USA, 7-13 Dec 1980)
7	6:15500	*See* SERI/TP-632-1113
CONF-801244-		(Workshop on weak interactions as probes of unification, Blacksburg, VA, USA, 3-6 Dec 1980)
3	6:16239	*See* BNL-29025
CONF-801245-		(EPA/DOE workshop on shale oil wastewater disposal, Denver, CO, USA, 2-3 Dec 1980)
2	6:15335	*See* LBL-12124
CONF-801246-		(First-wall in INTOR workshop, Willow Brook, IL, USA, 18 Dec 1980)
1	6:16320	*See* SAND-81-0037C
CONF-801249-		(DOE workshop on basic research in organic geochemistry applied to national energy needs, St Petersburg, FL, USA, 15-17 Dec 1980)
1	6:16126	*See* UCRL-85599
CONF-810101-		(American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) meeting, Chicago, IL, USA, 25-29 Jan 1981)
7	6:15961	*See* Y/EN-501
CONF-810107-		(2. international conference on recent progress in many-body theories, Mexico City, Mexico, 12-16 Jan 1981)
2	6:16291	*See* LA-UR-81-403
3	6:16280	NTIS, PC A02/MF A01
4	6:16290	*See* DOE/ER/01198-1341
CONF-810115-		(Nuclear and particle physics at energies up to 31 GeV: new and future aspects conference, Los Alamos, NM, USA, Jan 1981)
5	6:16282	*See* SLAC-PUB-2667
6	6:16255	*See* COO-3244-80
CONF-810128-		(Research conference, Pomona, CA, USA, 10-11 Jan 1981)
1	6:16330	*See* LA-UR-81-488
CONF-810129-		(Conference on valence fluctuations in solids, Santa Barbara, CA, USA, 27-30 Jan 1981)
1	6:16283	*See* BNL-28989
2	6:16286	*See* LA-UR-81-467
CONF-810130-		(American Association for the Advancement of Science symposium, Toronto, Ontario, Canada, 8 Jan 1981)
1	6:16065	*See* LBL-12251
CONF-810225-		(Workshop on seismic performance of underground facilities, Augusta, GA, USA, 11-13 Feb 1981)
2	6:16055	*See* SAND-81-0501C
CONF-810226-		(2. DOE/NASA wind turbine dynamics workshop, Cleveland, OH, USA, 24-26 Feb 1981)
2	6:15597	*See* SAND-80-2820C
CONF-810231-		(5. international conference on ion beam analysis, Sydney, Australia, 16-20 Feb 1981)
1	6:15838	NTIS, PC A02/MF A01
CONF-810308-		(American Chemical Society symposium on the chemistry of engine combustion deposits, Atlanta, GA, USA, 29 Mar-3 Apr 1981)
7	6:15844	*See* UCRL-82694(Rev.1)
8	6:16101	*See* DP-MS-80-106
9	6:16230	*See* HEDL-SA-2248
CONF-810312-		(International conference on excited states and multiresonance nonlinear optical process in solids, Modane, France, 18-20 Mar 1981)
2	6:16287	*See* LBL-12154
CONF-810314-		(Particle accelerator conference, Washington, DC, USA, 11-13 Mar 1981)
18	6:15986	*See* LBL-11692
19	6:15992	*See* UCRL-85650
20	6:16015	*See* UCRL-85036
21	6:15988	*See* SAND-80-2437C
22	6:16020	*See* BNL-29050
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44	6:15990	*See* UCRL-85049
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CONF-810315-		(8. energy technology conference and exposition, Washington, DC, USA, 9-11 Mar 1981)
7	6:15580	NTIS, PC A02/MF A01
CONF-810322-		(6. annual conference of the East Tennessee Chapter of the Association of Records Managers and Administrators, Inc., Knoxville, TN, USA, 26-27 Mar 1981)
1	6:16341	NTIS, PC A03/MF A01
CONF-810325-		(Workshop on measurement of electrical quantities in pulsed power systems, Boulder, CO, USA, 2-4 Mar 1981)
3	6:15636	*See* LA-UR-81-582
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1	6:16321	*See* SAND-81-0445C
CONF-810329-		(Pittsburgh conference of analytical chemistry and applied spectroscopy, Atlantic City, NJ, USA, 9-13 Mar 1981)
1	6:15409	*See* AGNS-35900-CONF-12
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1	6:15927	*See* UCRL-85585
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8	6:15814	NTIS, PC A03/MF A01
10	6:15330	*See* LBL-12019
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1	6:16118	*See* UCRL-85311
CONF-810423-		(1. International Energy Agency (IEA) conference on new energy conservation technologies and their commercialization, Berlin, F.R. Germany, 6-10 Apr 1981)
1	6:15806	*See* UCRL-85605
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1	6:16302	*See* UCRL-85491
2	6:16337	*See* UCRL-85225
CONF-810425-		(International conference on metallurgical coatings, San Francisco, CA, USA, 6-10 Apr 1981)
2	6:15550	*See* SAND-81-2176C
CONF-810501-		(National computer conference, Chicago, IL, USA, May 1981)
1	6:15690	*See* LA-UR-80-2993
2	6:16331	*See* LBL-11452
CONF-810502-		(3. symposium on safeguards and nuclear material management, Karlsruhe, F.R. Germany, 6 May-8 Mar 1981)
1	6:15414	*See* SAND-80-2569C
CONF-810503-		(35. annual quality congress and exposition, San Francisco, CA, USA, 27-29 May 1981)
1	6:15968	*See* BDX-613-2319

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1	6:15935	*See* SAND-81-0261C
2	6:15931	*See* MLM-2800(OP)
CONF-810507-		(Society for Experimental Stress Analysis meeting, Dearborn, MI, USA, 31 May-5 Jun 1981)
1	6:15823	*See* LA-UR-81-623
CONF-810508-		(28. international technical communication conference, Pittsburgh, PA, USA, 20-23 Mar 1981)
2	6:15973	*See* UCRL-85105
CONF-810509-		(Annual conference of the International Solar Energy Society, Philadelphia, PA, USA, 26-30 May 1981)
2	6:15511	*See* MLM-2812(OP)
3	6:15476	*See* SAND-80-2576C
5	6:15474	*See* DOE/ET/20279-119
CONF-810510-		(Electronic components conference, Atlanta, GA, USA, 11-13 May 1981)
1	6:15972	*See* SAND-81-0491C
2	6:15563	*See* SAND-81-0054C
3	6:15637	*See* SAND-80-2457C
4	6:15971	*See* SAND-80-2625C
CONF-810513-		(4. international conference on nondestructive evaluation in the industry, Lindau, F.R. Germany, May 1981)
1	6:15411	*See* LA-UR-81-358
CONF-810514-		(Carnahan conference on crime counter measures, Lexington, KY, USA, 13 May 1981)
1	6:15410	*See* AGNS-35900-CONF-121
CONF-810515-		(International conference on local networks and distributed systems, London, UK, 11-13 May 1981)
1	6:16338	*See* UCRL-85562
CONF-810516-		(4. international symposium on silicon materials science and technology, Minneapolis, MN, USA, 10-15 May 1981)
1	6:15848	*See* SAND-81-0568C
CONF-810517-		(International conference on computing in civil engineering, New York, NY, USA, 11-14 May 1981)
1	6:16238	*See* UCRL-85624
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1	6:16166	NTIS, PC A02/MF A01
DOE/EV/10090-		
1	6:16112	Columbia, SC: University of South Carolina Press (1980).
DOE/EV/10281-		
2	6:16057	NTIS, PC A02/MF A01
7	6:16058	NTIS, PC A02/MF A01
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6871	6:15379	New York, NY; Harwood Academic Publishers (1980).
6961-EN	6:15424	Luxembourg: Commission of the European Communities (1980).
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700-81-001	6:15634	California Energy Commission, Sacramento, CA
PATENTS-US-		(US: Commissioner of Patents, Washington, D.C. 20231, USA, $.50 per copy. Government Patent Applications available from NTIS)
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